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Electroplaters to Meet in Philadelphia

By Dr. A. K. GRAHAM

Associate Editor

Twentieth Annual Convention of the American Electroplaters' Society Will Be Held in Philadelphia, Pa., June 20th to 23rd, 1932, at the Benjamin Franklin Hotel.

PHILADELPHIA, with its numerous points of historic interest, its unusual industrial developments, unsurpassed shopping facilities and proximity to southern New Jersey seashore resorts, offers a unique variety of interests for those who wish to combine a vacation for themselves and families, with the opportunity of attending what many expect to be one of the great conventions of the American Electro-Platers' Society.

Dr. A. K. GRAHAM

From present indications the Twentieth Annual Convention of the Society will offer everything in respect to educational opportunities, industrial trips, and recreational facilities that have made the conventions of the past years occasions that no electroplater can afford to miss. At the same time, the registration fee has been reduced to one dollar, and everything possible has been done to curtail the expense without sacrificing any of the enjoyable features that one usually expects.

Another feature that will doubtlessly appeal to the members of the Society is that no sessions have been scheduled for the evenings. One night is reserved for the annual banquet, another for entertainment furnished by the International Fellowship Club, and the remaining evenings may be devoted to pleasure of the individual's choosing.

Hotel Accommodations

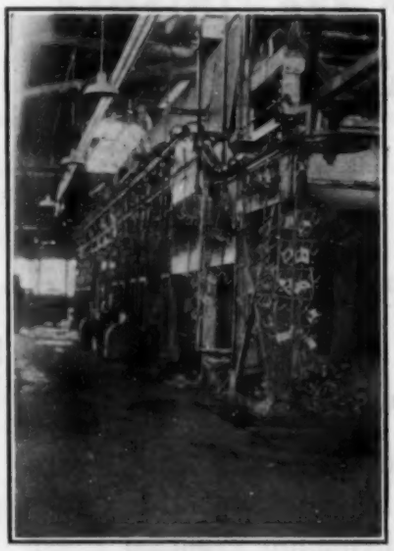
The Benjamin Franklin Hotel, the convention headquarters, is one of the best equipped hotels in the city.

University Museum, University of Pennsylvania, Philadelphia.

The members staying there are sure to be most comfortable. The rates for the Convention will be $4.00 a day for a single room with bath, and $6.00 a day for a double room with twin beds and bath.

Industrial Trips

In spite of the fact that a number of plants are not certain of being operated full time, the Committee has succeeded in arranging a most interesting group of plant visits. In addition to the plants listed, it is possible that a number of other concerns will be added to the list from which to choose, provided they are operating on the dates of the Convention.



Full Automatic Plating Equipment at Philadelphia Storage Battery Company.

1. General Electric Company.

2. R C A Victor Company.

3. Philadelphia Storage Battery Company.

At all three of these plants the processing of a great variety of work will be witnessed. Still plating, barrel semi- and full automatic and other mechanical features will be observed.

4. Philadelphia Navy Yard.

The aircraft factory at the League Island Yard will be of interest to all, but the anodic treatment of aluminum parts will doubtless be the special feature of this trip.

5. DeLong Hook and Eye Company.

At this plant production methods of handling small parts will be very ably demonstrated, and making hooks and eyes and snap fasteners will interest the ladies.

6. Royal Electrotype Company.

For those interested in electrotyping this plant offers an excellent opportunity of observing up-to-date methods and equipment. Chromium plating and the production of thick copper electrotypes without backing up will be featured.

7. University Museum.

This trip should prove of interest to the ladies as well as to the men. The valued collection of jewels and objects of bronze, silver and gold from Ur date back 6,000 years to the time of Queen Shubad. An opportunity to visit the laboratory where the alloys of these ancient times are restored will be granted.

Convention Papers

A symposium on zinc will comprise one of the educational sessions at which time all phases of the plating on zinc and the electrodeposition of zinc will be discussed.

Dr. M. deKay Thompson of the Massachusetts Institute of Technology, Dr. Louis Kahlenberg, of the University of Wisconsin, and Dr. E. A. Vueillemier, of Dickinson College, are presenting papers before the Society for the first time. The subjects treated by them and the other authors cover a great variety of interests, so that the educational phase of the Convention is an assured success.

Ladies' Program.

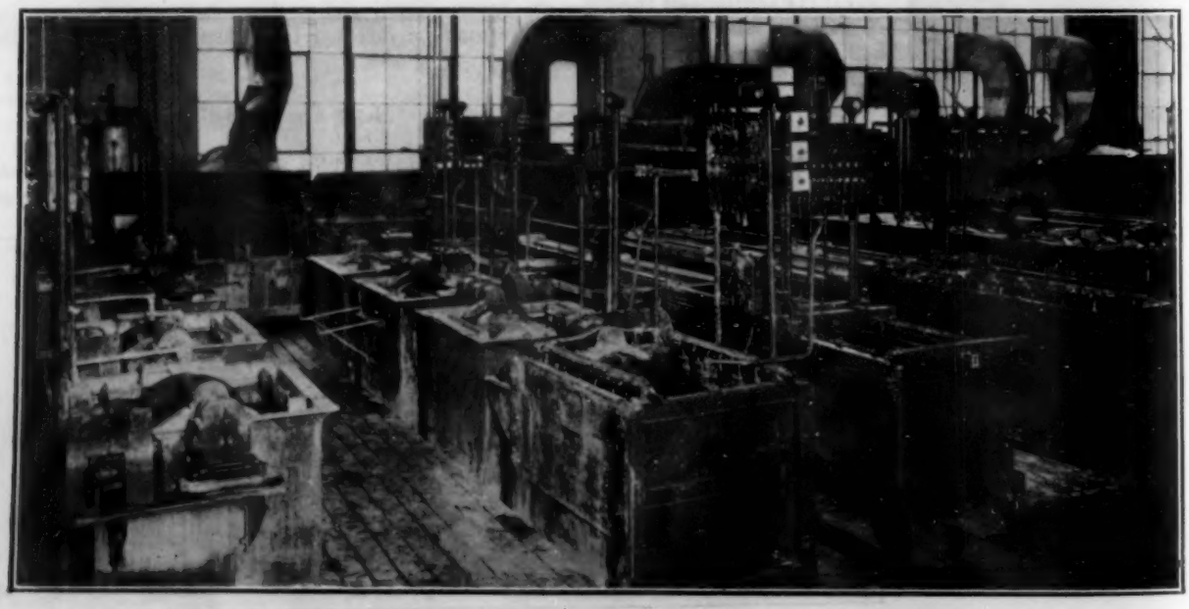
The program for the ladies includes a number of interesting features. Trips may be taken through the Curtis Publishing Company, the home of the Ladies' Home Journal, the DeLong Hook and Eye Company, the Naval Aircraft factory and the University Museum.

Boat Trip

An all day boat trip down the Delaware River, a motor tour of the city of Philadelphia and a trip to Atlantic City are also planned.

Fellowship Club—Open House

The Fellowship Open House will take place at the Green Room of the Philadelphia Elks Club. Transporta-



PLATING ROOM OF THE GENERAL ELECTRIC COMPANY PLANT AT PHILADELPHIA

tion to and fro, as well as entertainment, music for dancing, refreshments and luncheon will be supplied by the International Fellowship Club. Registrants at the convention will also receive, upon registering, a leaflet if invitation to the Open House, with full details of the arrangements. It is emphasized that those attending will simply have to be there to enjoy themselves. There will be nothing to buy.

Green Room at the Elks Club, Philadelphia, Where the International Fellowship Club will Entertain

Committees on Arrangements

Past-President George Gehling has been appointed director of the convention, and the following committees will assist him to make all arrangements and also look after the welfare of all attending the convention:

Hotels: Otto Mott and Edward Homan, 4620 North Boudinot Street, Philadelphia.

Plant Visits: Joseph L. Dinan, 124 North Pennock Street, Highland Park, Pa.

Registration: Joseph E. Underwood, 327 North 10th Street, Camden, N. J.

Banquet: Harry Snyder, 3942 North Marshall Street, Philadelphia.

Ladies' Entertainment: J. J. Basch, 310 Wesley Building, Philadelphia.

Men's Entertainment: Warren Reynolds, 807 Hellerman Street, Philadelphia.

Program of the Electroplaters' Society Convention

Monday, June 20

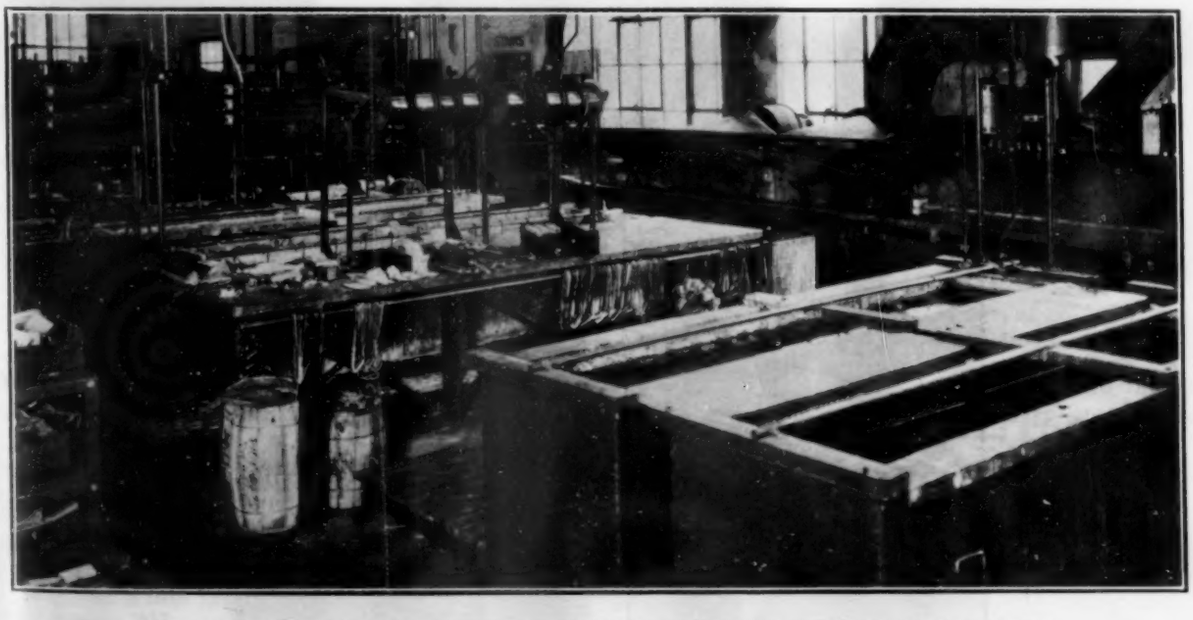
A.M. Registration at the Hotel.

10.00 A.M. Business Session.

1.30 P.M. Educational Session, Dr. H. S. Lukens, University of Pennsylvania, Chairman:

1. "Electrodeposition of Tungsten from Alkaline Solutions," by Dr. Louis Kahlenberg and M. L. Holt of the University of Wisconsin.
2. "Peeling of Electrodeposited Nickel," by Dr. E. A. Vueillemier of Dickinson College.
3. "Review of Recent Foreign Literature," by Dr. M. deKay Thompson of the Massachusetts Institute of Technology.
4. "A Study of Base Metals in Industrial Chromium Plating Applications," by Lieut. Arthur Willink, Frankford Arsenal.
5. "Free Cyanide in Brass Plating Baths," by Dr. L. C. Pan, New York University.
6. "The Decomposition of Cyanide Solutions," by R. M. Wick, Bureau of Standards, Washington, D. C.

8.00 P.M. The International Fellowship Club will be host to the delegates and guests, at the Green Room of the Elks' Club.



ANOTHER VIEW OF THE GENERAL ELECTRIC COMPANY PLATING DEPARTMENT

Tuesday, June 21

9.00 A.M. Educational Session — Symposium on Zinc Plating, Dr. A. K. Graham, University of Pennsylvania, Chairman:

1. "Plating of Zinc Base Die Castings," by R. J. Wirshing, General Motors Company.
2. "Plating on Zinc," by W. M. Pierce, New Jersey Zinc Company.
3. "Electroplating Zinc on Aluminum," by Harold K. Work, Aluminum Company of America.
4. "Anodes for Zinc Plating," by Dr. A. K. Graham, University of Pennsylvania, and G. B. Hogaboom, Hanson-Van Winkle-Munning Company.
5. "Barrel Plating with Particular Reference to Optimum Loads and Costs," by Gustaf Soderberg, Udylite Company.
6. "Barrel Plating with Duo-Zinc Solution," by F. F. Oplinger, Roessler and Hasslacher Chemical Company.

1.30 P.M. Plant Visits:

1. General Electric Company.
2. R C A Victor Company.
3. DeLong Hook and Eye Company.

Tuesday night is left open for the members and guests to arrange their own parties.

Wednesday, June 22

9.00 A.M. Educational Session, Mr. S. T. Lunbeck, Chairman:

1. "Anodic Deposition of Rubber," by Albert Hirsch, Carey McFall Company.
2. "Finishing Steel Products by Use of Sand, Shavings, Soap Suds and Steel Balls," by Walter S. Barrows, Toronto Branch.
3. "Determination of Hydrogen Ion Concentration," by Dr. E. Sanigar, Philadelphia Branch.
4. "Alumilite," by H. Bengston and R. E. Pettit, Aluminum Colors, Inc.
5. "Developments in Metal Lacquers," by L. M. Hayden, Zapon Company.
6. "Recent Development in Lacquers," by Kenneth L. Longnecker, Stanley Chemical Company.

1.00 P.M. Plant Visits:

1. Naval Aircraft Factory, Philadelphia Navy Yard.
2. Philadelphia Storage Battery Company.
3. Royal Electrotype Company.
4. University Museum, University of Pennsylvania.

The Past Year's Officers of the American Electroplaters' Society

C. E. MARKER
Second Vice-President

PHILIP SIEVERING
President

H. A. GILBERTSON
Secretary-Treasurer

GEORGE GEHLING
Director of the 1932 Convention.

W. J. R. KENNEDY
Editor of the Monthly Review.

7.00 P.M. **Annual Banquet, Crystal Ball Room, Benjamin Franklin Hotel, Mr. Harry Snyder, Chairman.**

Thursday, June 23

9.00 **A.M. Educational Session.**

1. "Summary of Researches on Plating at the Bureau of Standards," by Dr. W. Blum, Bureau of Stand- Washington, D. C.
2. "Progress Report on Exposure Tests and Accelerated Tests of Plated Coatings," by Dr. William Blum, Bureau of Standards, Washington, D. C.
3. "Experiences in the Preparation of Specimens for Exposure Tests," by P. W. C. Strausser, Research Associate, Bureau of Standards, Washington, D. C.
4. Report of Research Committee, J. Hay, Chairman.
5. Report of Educational Committee, A. Hirsch, Chairman.

1.30 **P.M. Business Session followed by the election of officers for the ensuing year and selection of the next convention city.**

Ladies' Program

Electroplaters' Society Convention

Monday, June 20

2.00 P.M. Visit to Curtis Publishing Company.
8.00 P.M. The International Fellowship Club will be host to the delegates and guests.

Tuesday, June 21

9.45 A.M. Sight-seeing trip.
1.30 P.M. Visit to R.C.A. Victor Company and De-Long Hook and Eye Company.

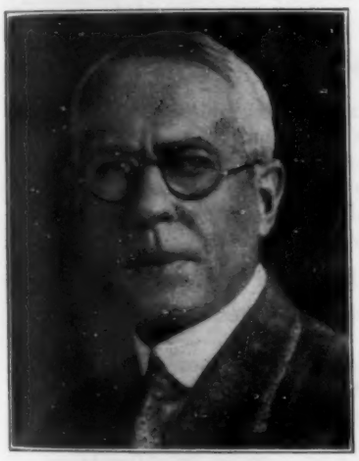
Wednesday, June 22

9.45 A.M. Visit to the University Museum, University of Pennsylvania.
7.00 P.M. Annual Banquet, Crystal Ball Room, Benjamin Franklin Hotel.

Thursday, June 23

Trip to Atlantic City.
Boat Trip to Wilmington, Del.

Officers of the International Fellowship Club, 1931-32



N. P. HUNTER
Vice-Chairman

ROBERT LEATHER
President

T. A. TRUMBOUR
Secretary-Treasurer

The Theory of Chromium Plating

In our May issue, on page 180, we published an abstract of a series of three articles by Professor Erich Muller, and his associates on The Theory of Chromium Plating. Since then a fourth article has been published by the same author in Zeit. Elek Chem. Volume 36, page 2 (1930); also a fifth article in the same journal, Volume 38, No. 4, page 205.

Bronze for Screen Plates

Q.—Can you tell us the specifications for bronze used in the manufacture of screen plates for paper and pulp mills?

A.—The alloy used in screen plates by a large manufacturer of this product is 98 copper, 2 tin, with a small phosphorus addition.

W. J. P.

Exposure Tests on Plated Metals

By the Joint Committee of American Electroplaters' Society, American Society for Testing Materials and the Bureau of Standards

A Report on the Preparation of Specimens for Exposure Tests of Electroplated Coatings on Steel*

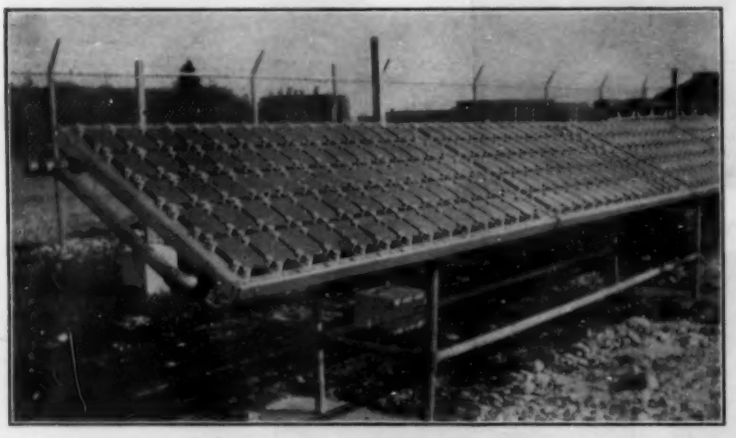
FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, MAY, 1932

ALL specimens were prepared at the Bureau of Standards by the Research Associate of the American Electroplaters Society, with the assistance of the Bureau staff, and will be exposed through co-operation with the American Society for Testing Materials.

The exposure tests will be started in the spring, 1932, at Sandy Hook, N. J.; Bell Laboratories, New York City; Pennsylvania State College, Pittsburgh, Pa.; Washington, D. C., and Key West, Fla. Five specimens of each kind will be exposed in each location. These samples will be inspected at regular intervals by members of the joint committee consisting of:

Jacob Hay, Walter Fraine, A. K. Graham, W. M. Phillips, R. F. Passano, L. H. Rovere, and W. Blum, chairman.

Notices of these inspection trips will be sent to the co-operating firms listed in this report and to others who request the chairman for such notices. Any interested persons may be present at these inspections, with the understanding that they will not use any information obtained at that time for publication or for advertising purposes.



Racks for Exposure of Electroplated Samples at Key West, Florida. In each location there are eight racks, each holding 70 specimens.

Corresponding samples will be subjected to laboratory tests, including accelerated corrosion, to determine the relation of these results to atmospheric exposures. The results of these exposure and laboratory tests will not be published until definite conclusions can be reached by the inspection committee.

In general, a certain arbitrarily selected "standard" procedure for cleaning and plating was employed as a basis of reference, without any implication that such a procedure is necessarily superior. Some important step in the process was then varied over sufficiently wide limits to determine whether such a change produces a definite effect upon the protective value of the coatings. The samples include steel finished with nickel, chromium, zinc or cadmium, in some cases preceded by preliminary coatings.

Conditions Used

In the following outline, the conditions used are briefly defined. No attempt has been made to give exact equivalents of metric and English units. Most of the laboratory measurements were metric. The thickness of deposits are here expressed only in English units, but the final reports may include both.

1. Cleaning Procedure:

A—Standard—The plates were treated as follows:

(1) The surface grease was removed with amyl acetate and carbon tetrachloride.

(2) Cathode electrolytic cleaning was used.

Solution Formula

	N	g/l	oz/gal
Sodium carbonate, Na_2CO_3..	0.6	30	4
Trisodium phosphate, $Na_3PO_4.12H_2O$	0.25	30	4
Sodium hydroxide, NaOH...	0.2	7.5	1

Temp. = 194° F (90° C). A current density of about 47 amp/sq. ft. (5 amp/dm²) was applied for 5 minutes.

(3) Scrubbed with a bristle brush wet with the same cleaning solution.

(4) Rinsed in hot water.

(5) Pickled in sulphuric acid, 2 *N* solution (containing about 10 per cent by weight of H_2SO_4) at 122° F (50° C) for 2 minutes.

(6) Rinsed in cold water.

A-1—(Hot Alkali Dip). The procedure was the same as in A, except that after (6) the plates were immersed for 5 minutes, without current, in the hot cleaning solution, scrubbed and rinsed.

B—Cathode Pickling—The same procedure was used as

* Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

in A, except that in (5) the steel was pickled as cathode in 2 *N* H_2SO_4 at 122° F (50° C) and 19 amp/sq. ft. (2 amp/dm²) for 2 minutes, and lead anodes were used.

C—Anode Pickling—The same procedure was used as in A, except that following (5) the steel was pickled as anode in 96 per cent sulphuric acid at 70° F (22° C) and 12 volts, with lead as the cathode, until the current dropped to a minimum.

2. Conditions for Nickel-Plating:

Rolled nickel anodes (99+ per cent) were used. The operating conditions were as follows:

E—Standard—

Solution Formula

	N	g/l	oz/gal
Nickel sulphate, $NiSO_4.7H_2O$	1.4	200	27
Nickel chloride, $NiCl_2.6H_2O$	.4	45	6
Boric acid, H_3BO_3	0.5M	30	4

pH = 5.3 (Quinhydrone, or colorimetric corrected)
Temp. = 95° F (35° C)
Current density = 19 amp/sq. ft. (2 amp/dm²)

E-1—High Temperature
Solution formula and pH same as E.
Temp. = 140° F (60° C)
Current Density = 37 amp/sq. ft. (4 amp/dm²)

F—Low pH—
Solution formula same as E.
pH = 2.5 (Quinhydrone, or colorimetric corrected)
Temp = 140° F (60° C)
Current Density = 37 amp/sq. ft. (4 amp/dm²)

F-1—The solution formula and pH were the same as in F.
Temp. = 122° F (50° C)
Current Density = 47 amp/sq. ft. (5 amp/dm²)

G—For Plating Nickel Over Zinc or Cadmium Coatings—

Solution Formula

	N	g/l	oz/gal
Nickel sulphate, $NiSO_4.7H_2O$	1.0	140	19
Ammonium chloride, NH_4Cl	0.25	15	2
Sodium sulphate, Na_2SO_4	2.0	140	19
Boric acid, H_3BO_3	0.25	15	2

pH = 5.7 (Quinhydrone, or colorimetric corrected)
Temp. = 70° F (22° C)
Current Density = 19 amp/sq. ft. (2 amp/dm²)

3. Conditions for Chromium Plating:

Lead anodes containing 6 per cent of antimony were used. The operating conditions were as follows:

I—Standard—

Solution Formula

		g/l	oz/gal
Chromic acid, CrO_3	2.5M	250	33
Sulphuric acid, H_2SO_4	.05*N*	2.5	0.33

Temp. = 113° F (45° C)
Current Density = 150 amp/sq. ft. (16 amp/dm²)

I-1—Solution formula as in I
Temp. = 95° F (35° C)
Current Density = 75 amp/sq. ft. (8 amp/dm²)

I-2—Solution formula as in I
Temp. = 130° F (55° C)
Current Density = 250 amp/sq. ft. (27 amp/dm²)

I-3—Solution formula as in I
Temp. = 150° F (65° C)
Current Density = 350 amp/sq. ft. (38 amp/dm²)

J—Solution with low sulphate content

Solution Formula

		g/l	oz/gal
Chromic acid, CrO_3	2.5M	250	33
Sulphuric acid, H_2SO_4	0.025*N*	1.25	0.17

Temp. = 113° F (45° C)
Current Density = 150 amp/sq. ft. (16 amp/dm²)

K—Solution with high chromic acid content

Solution Formula

		g/l	oz/gal
Chromic acid, CrO_3	4M	400	53
Sulphuric acid, H_2SO_4	0.08*N*	4	0.53

Temp. = 113° F (45° C)
Current Density = 150 amp/sq. ft. (16 amp/dm²)

K-1—Solution formula as in K
Temp. = 130° F (55° C)
Current Density = 250 amp/sq. ft. (27 amp/dm²)

K-2—Solution formula as in K
Temp. = 150° F (65° C)
Current Density = 470 amp/sq. ft. (50 amp/dm²)

4. Conditions for Copper Plating:

Rolled copper anodes were used. The operating conditions were as follows:

L—Cyanide Copper—

Solution Formula

	N	g/l	oz/gal
Copper cyanide, CuCN	0.25	22.5	3
Sodium cyanide, NaCN	0.65	34	4.5
Sodium carbonate, Na_2CO_3	0.30	15	2
(Resultant free sodium cyanide)	0.15	7.5	1

Temp. = 120° F (50° C)
Current Density = 14 amp/sq. ft. (1.5 amp/dm²)

M—Acid Copper—

Solution Formula

	N	g/l	oz/gal
Copper sulphate, $CuSO_4.5H_2O$	2	250	33
Sulphuric acid, H_2SO_4	1.5	75	10

Temp. = 95° F (35° C)
Current Density = 23 amp/sq. ft. (2.5 amp/dm²)

This Report will be concluded in an early issue.—Ed.

Metal Content for Nickel on Brass

Q.—Will you please recommend the metallic nickel content, chloride content and pH concentration for a double plating solution used for plating small brass ferrules with current at about 5 volts?

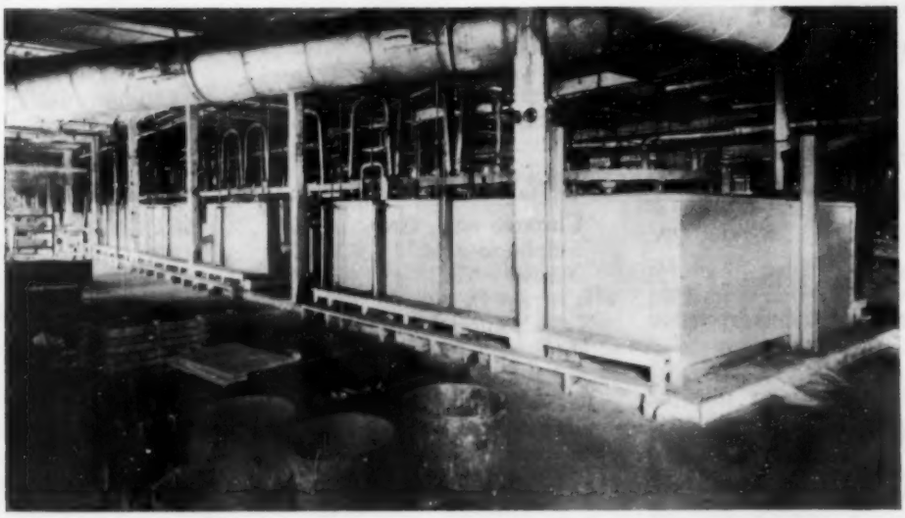
Will you also suggest a simple and practical way of testing for chloride content?

A.—If by a "double plating" solution is meant a double nickel salt solution, the metal content should be about 1½ ozs. per gallon. If 95-97% nickel anodes are used, the chloride content, as ammonium chloride, should be 2 to 3 ozs. per gallon.

Apparatus for testing chloride content can be obtained from firms advertising in METAL INDUSTRY.

G. B. H.

Rubber-Lined Solution Tanks for Automatic Plating Machines

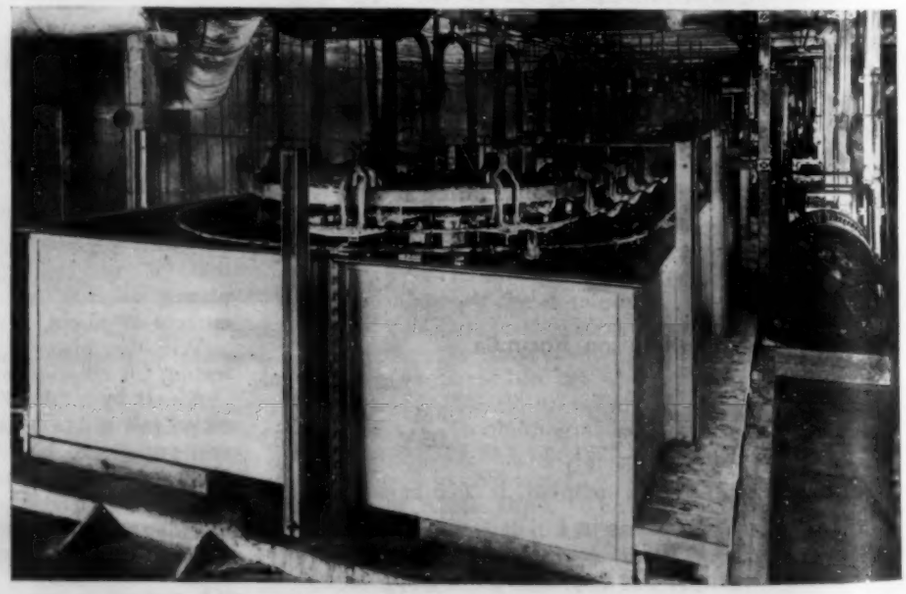


Two Small, All Hard Rubber Lined Tanks 4 ft. 10½ in. by 4 ft. 1 in. by 4 ft. 10 in. Deep, Installed by Hanson-Van Winkle-Munning Company, in the Plant of the H. H. Franklin Manufacturing Company.

A VERY interesting installation was made by the Hanson-Van Winkle-Munning Company at the plant of the H. H. Franklin Manufacturing Company, makers of the Franklin air-cooled automobile, at Syracuse, N. Y., in the Fall of 1929, which consisted of a heavy duty, return type, full automatic cleaning and plating conveyor, including all of the tanks and tank accessories necessary to clean, rinse, acid dip, and acid and cyanide copper plate—preparatory to nickel plating—approximately seven thousand miscellaneous car parts per nine hour day, with current produced by Hanson-Van Winkle-Munning Company's motor generator sets, rated to give a combined amperage of 10,000 amps. The installation was similar to numerous others made by Hanson-Van Winkle-Munning Company in the plants of other automobile manufacturers, manufacturers of automotive accessories, electrical contrivances, razors, etc.

Several of the steel welded tanks were hard rubber lined, the rubber lining having been supplied by the American Hard Rubber Company, New York. It is noticeable that these linings have proved satisfactory, requiring no attention or repairs during their use. Although the machine was basically a standard product of the Hanson-Van Winkle-Munning Company, it had to be changed in certain respects to suit the requirements of the H. H. Franklin Manufacturing Company.

As is Hanson-Van Winkle-Munning Company's custom when making a full automatic installation, a comprehensive study was made of all the steps in the manufacture of the parts to be treated, in order that any additional necessary equipment, such as machines or supplies, might be obtained at the same time. As a result, the Franklin Company ordered thirteen motor lathes and large poundages of tripoli and lime composition from Hanson-Van Winkle-Munning for use in conjunction with the automatic equipment, as well as nickel and copper anodes and salts for use in the plating processes.



All Hard Rubber Lined Tank, L-Shaped, 41 ft. 7 in. Long, Installed by the Hanson-Van Winkle-Munning Company in the Plant of the H. H. Franklin Manufacturing Company.

A Model Metal Coating Research Laboratory

By E. F. BERRY

Udylite Process Company, Detroit, Mich.

Udylite Process Company Builds New and Larger Laboratories for Plating, Electrochemistry, Analysis and Corrosion Testing.

CADMIUM plating by the Udylite Process was born in a beaker on an electrochemist's table. Thereafter, each growth recorded was the result of findings in the electrochemical laboratory. From a small beginning, thirteen years ago, it has developed to such proportions that it is no longer to be confined within a small laboratory. When the Udylite Process Company moved to Detroit in 1927, the then new laboratory consisted of one room of 800 square feet. A substantial increase was made in 1930 when three rooms were added. A steady increase in number of users of Udylite and the increasing demand for the solution of many rust proofing problems have made it necessary for the Udylite Process Company again to enlarge its laboratory facilities. Consequently, the company has moved its general offices and laboratories to a modern fireproof brick building, which provides more space for necessary offices, storage facility and laboratory expansion.

The first or ground floor of the building, a two-story structure, is devoted entirely to office and storage space. The major portion of the second floor is occupied by the technical division.

In Fig. 1 is presented a floor plan of the space occupied by the electrochemical research laboratory, library and office, analytical laboratory, with separate corrosion testing room, and one of the largest and best equipped experimental plating laboratories in the world. It has separate generator, sandblast, and lacquer rooms located adjacent to it.

Office

Technical inquiries go to this office to be correlated with previous experience. Herein is located a very complete library on corrosion and corrosion protection, electroplating, electrochemistry, besides the ordinary subjects of analysis, general chemistry, metallurgy, etc. This room also contains the technical files of the company arranged according to subject. After the inquiries have been digested, a program of experiments may have to be laid out and routed through the laboratories and back to the office, from where the information is sent out.

The files are built up from technical reports from the field, written by the service engineers, laboratory reports and photostats of articles from magazines and books. For the purpose of keeping in close contact with industry, fifty-three publications, in several languages, are received regularly. Of this number, thirteen are electrochemical and plating journals. In addition one dozen patent journals are obtained from various countries. Particularly valuable articles are distributed among the engineers in the field for reference.

For the quick dissemination of information there is available a photostat machine, blue print machine, duplicator and addressograph. The photostat machine and the blue print machine are kept in a special room, adjacent to the office.

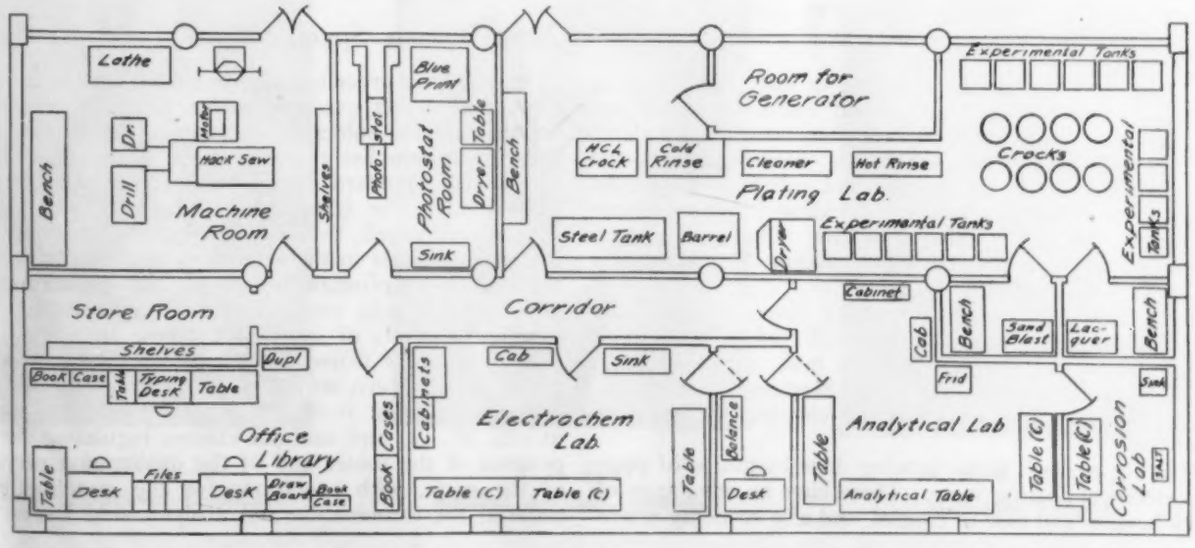


FIG. 1—PLAN OF THE PORTION OF SECOND FLOOR WHICH IS DEVOTED TO LABORATORY SPACE

Electrochemical Laboratory

Here are two set-ups for plating experiments in beakers, with necessary control instruments. Instruments for potential measurements and conductivity measurements are also available. Here the electrochemical properties of plating solutions are being studied, a very

Fig. 2—The Electrochemical Laboratory. Door in Background Leads to Balance Room.

complicated subject indeed. View of this room is shown in Fig. 2.

Analytical Laboratory

This laboratory is equipped for ordinary analytical work, which includes the testing of solutions and raw materials. Besides ordinary chemical analysis, the Udylite solutions are also subjected to plating tests which give direct indication of what the solutions are capable of producing. The licensees' solutions are tested at least once a year, and no solution is allowed to go out of the laboratory unless it measures up to very strict standards.

The balance room, with analytical balance and rough scales for weighing, is located between this room and the electrochemical laboratory.

Corrosion Laboratory

This laboratory contains the ordinary salt spray machine and also a machine for alternate immersion tests. The former one is used steadily by the licensees of the company.

Plating Laboratory

This laboratory, a view of which is given in Fig. 3, is one of the most interesting parts of the installation. Here the beaker experiments are developed for the production stage. The layout provides for the study of cleaning and plating cycles and for the easy preparation of samples.

In one end are located a number of tanks with varying plating solutions, such as several cadmium tanks and nickel tanks, tanks with copper, chromium, zinc and tin plating solutions, also tanks for electrocleaners, the Bullard-Dunn pickling process and others. A number of crocks contain various acid pickling solutions, stripping solutions and coloring solutions. The small plating tanks can also be used for barrel plating by means of a small portable barrel.

The other end of the laboratory houses a full scale Udylite plating plant, including a still tank, a barrel tank (National plating barrel), a pickle tank, a cleaner tank, a cold and hot water rinse, a hot air blast and a centrifugal dryer. Here is also a machine for cleaning by means of tumbling.

Heating of small tanks is being done by means of portable electrical heating units. These have an advantage of quick heating and ease of control, and also economy where the intermittent need of heat is considered. One set of heating elements are plain steel, and are used in alkaline solutions and in water. Another set is lead coated and used in acid solutions. These heating units can be plugged into receptacles distributed above the tanks. The large tanks are heated by gas units from The Stolle Corporation.

Electrical power for the various operations is being produced by two generators, which are placed in a separate generator room. Both of these generators are made by the Chandeysson Electric Company. One is a 12 volt, 125 ampere set; the other a 6 volt, 1,000 ampere set. They are capable of operating at high overloads. Starting switches and panel boards are situated in the plating laboratory proper.

All plating units are provided with Crown rheostats,

Fig. 3—Part of Experimental Plating Laboratory Showing Rows of Experimental Tanks.

which provide close current regulations necessary in the plating laboratory.

For the sake of cleanliness a cement flooring covered with asphaltum was installed. The floor slopes towards three drains placed symmetrically. On top of the asphaltum are duckboards.

Adjacent to the plating laboratory are two rooms, one equipped for lacquering and another for sand blasting.

Machine Shop

The machine shop is equipped with a turning lathe, a polishing lathe, one big and one small drill press, a mechanical hacksaw, a portable acetylene welding outfit and benches, and tools for the construction of any special equipment that is needed for experimental purposes.

New British Specifications for Soft Solders

Primarily in order to make provision for the incorporation of a further grade of solder, Grade K, suitable for certain machine soldering operations, the British Standards Institution has recently issued a revised edition of the British Standard Specification for Soft Solders, No. 219—1932. The compositions of the grades A to J remain unchanged, though modifications have been made in some instances in the references to the uses for which the solders are primarily intended. Some additional provisions have been made in the clause relating to the chemical analysis of samples. A new British Standard Specification for Cored Solder, Rosin Filled, No. 441—1932, has also been issued. This provides for six standard sizes ranging from No. 8 (0.160 in.) to 16 (0.064 in.) S. W. G., and contains clauses regulating the composition of the solder and of the quality and proportion of the rosin, with provisions for the sampling of the material for examination and analysis.—A. Eyles.

Foundrymen's Meeting in Detroit

By H. M. ST. JOHN
Associate Editor

Technical Sessions, Round Tables and Shop Operation Courses Very Well Attended and of a High Order.

THE 36th annual convention of the American Foundrymen's Association was held at the Hotel Statler, in Detroit, May 2d to 5th. The total registration was approximately 700, a figure substantially higher than had been expected by those in charge of the meeting. There was, of course, not even a limited exhibition of foundry equipment and supplies, a fact which may have contributed to the exceedingly satisfactory attendance at the technical and business sessions. The total of individual meetings was slightly less than has been customary but those held were notable for excellent papers, discussed with earnestness and spirit. Possibly there were less holiday makers than usual; at any rate the atmosphere was distinctly businesslike and rather suprisingly optimistic.

The American Society of Mechanical Engineers held meetings of its Materials Handling and Management Divisions at the same time and place. These meetings and those of the A. F. A. were participated in by the Detroit Foundrymen's Association, the Electric Hoist Manufacturers Association, the Foundry Equipment Manufacturers Association, the Gray Iron Institute, the Malleable Iron Research Institute and the Materials Handling Institute.

In place of the annual banquet a stag dinner was held, replacing also the usual dinner of the Foundry Equipment Manufacturers Association. This dinner was completely informal, a number of entertainment features taking the place of the usual speech making.

New Officers

At the annual business meeting the following officers and directors were elected:

President, to serve for one year:

T. S. Hammond, President, Whiting Corporation, Harvey, Ill.

Vice-President, to serve for one year:

Frank J. Lanahan, President, Fort Pitt Malleable Iron Company, Pittsburgh, Pa.

Directors, to serve three-year terms each:

E. H. Ballard, General Foundry and Pattern Shop Superintendent, General Electric Company, West Lynn, Mass.

H. Bornstein, Director, Testing and Research Laboratories, Deere & Company, Moline, Ill.

S. B. Cuthbert, Superintendent of Foundries, Edgar Thomson Works, Carnegie Steel Company, Braddock, Pa.

David Evans, President, Chicago Steel Foundry Company, Chicago, Ill.

Franklin G. Smith, President, Osborn Manufacturing Company, Cleveland, Ohio.

President Ballard presided and delivered an address of great timeliness. President Ballard's talk, together with Secretary Hoyt's annual report which was presented at the same meeting, painted a complete and most encouraging picture of the measures taken by the Association to meet the problems imposed upon it by the stresses of prevailing conditions.

J. L. WICK, Jr.
Member, Advisory Committee

T. D. STAY
Member, Advisory Committee

Dr. H. W. GILLETT
McFadden Medalist

Medal Awards

The business meeting was also the occasion for the presentation of the Association's two medals and of the various apprentice awards. Past President R. A. Bull spoke with deep feeling in recounting the achievements and personal qualities of the late Laverne W. Spring, recipient of the John A. Penton gold medal, following which a resolution was passed in respect to his memory. The William H. McFadden gold medal was presented to Dr. Horace W. Gillett, Director of the Battelle Memorial Institute, who responded with a few words of tribute to those who had worked with him in accomplishing the "Outstanding contributions to the advancement of the metal casting industry," for which the medal was awarded.

Apprentice Prizes

The apprenticeship prizes were awarded as follows:

PATTERN MAKING

1. **Steven Lukacek,** Wehr Steel Company, Milwaukee, Wisconsin.
2. **Oscar Frederick,** Brown & Sharpe Manufacturing Company., Providence, R. I.
3. **Charles Deak, Jr.,** American Steel Foundries, East Chicago, Ind.

IRON MOULDING

1. **Moroni Heap,** Brown & Sharpe Manufacturing Company, Providence, R. I.
2. **Thomas Smedley,** Red Jacket Pump Company, Davenport, Iowa.
3. **Charles Smith,** Blackhawk Foundry & Machine Company, Davenport, Iowa.

STEEL MOULDING

1. **Levi Burkhart,** Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa.
2. **William Dettmer,** Falk Corporation, Milwaukee, Wis.
3. **Elijah Wilkerson,** American Steel Foundries, East Chicago, Ind.

A memorable feature of the week was the address delivered by S. Wells Utley at the luncheon of the Foundry Equipment Manufacturer's Association. A large audience followed with close attention Mr. Utley's masterly exposition of "What Price Taxes," in which he showed clearly the staggering burden which the constantly increasing cost of government is imposing upon both industry and the individual.

Shop Operation Courses and Round Tables

It is evident to anyone attending these Foundrymen's conventions year after year, for a considerable period of time, that the type of informal meeting where everyone gets together and talks things over is rapidly increasing in importance and popularity. This year shop operation courses were held by the Gray Iron Division, the Steel Division, the Non-Ferrous Division and the Joint Committee on Moulding Sands. Round Table luncheons were held by the above three divisions, and also by the Malleable Division and by the Committee on Pattern Production.

The Non-Ferrous Round Table, under the chairmanship of William Romanoff, with H. F. Seifert assisting, was interesting and profitable as usual. The Non-Ferrous Shop operation course held three sessions on moulding sand problems in the brass foundry, with H. M. St. John, H. W. Dietert, L. H. Marshall and G. K. Eggleston as leaders.

The usual round of shop visits, including a noteworthy one to the Ford Motor Company's Rouge plant and Greenfield village, together with committee meetings and conferences, rounded out the informal technical activities of the week. The social events and purely entertainment features were less numerous and less emphasized than usual, but were none the less ample and thoroughly enjoyed.

It has been intimated that the more formal technical sessions have had to share time increasingly with round tables and less formal conferences. While this is certainly true it is doubtful whether the technical meetings have suffered as a result of the encroachment. Attendance has been maintained at a high point, while the discussions have perhaps been improved as a result of practice in less formal surroundings by some who formerly did not express themselves at the technical meetings.

The Non-Ferrous Division held two technical sessions, the first under the chairmanship of Sam Tour, chairman of the Division, with F. L. Wolf as vice chairman, while the second was presided over by John W. Bolton, with the impromptu assistance of H. M. St. John. Four papers were given and will be briefly reviewed here.

Dr. P. D. MERICA
Member, Advisory Committee

D. H. WRAY
Member, Advisory Committee

W. ROMANOFF
Chairman, Nonferrous Round Table

Lewis H. Fawcett, of the U. S. Naval Gun Factory, presented a paper entitled "The Influence of Design on Brass and Bronze Castings." This was originally intended for the information primarily of engineers who are responsible for the design of castings but was presented to the foundrymen with the thought that it would be of help in discussions between foundrymen and purchasers of castings. Evenness of metal section is stressed as of the greatest importance in securing sound castings. The coring out of bosses and other projections, arrangements for suitable gating, the influence of alloy composition on the design of the casting, are all discussed in considerable detail. Several examples of good and poor design are shown. In the absence of the author, this paper was given by R. E. Kennedy.

"A Method for Study of Shrinkage and Its Distribution to Castings," by N. B. Pilling and T. E. Kihlgren, of the International Nickel Company, was presented by the former. The paper describes a novel and easily applied method for determining solidification shrinkage with considerable accuracy and uniformity. For details of the method it will be necessary to refer to the monthly Transactions of the Association, in which it will soon be published. Results for a number of non-ferrous alloys are given and these provoked a good deal of discussion, since they do not altogether agree, either with previously published results or with the preconceived ideas of the foundryman. For example, aluminum bronze, which has a bad reputation for high shrinkage, is shown to have a lower shrinkage than the 85-5-5-5 alloy, which enjoys an excellent reputation in this respect. The authors believe that the difference in the casting properties of these alloys, and others like them, lies in the fact that aluminum bronze quickly forms a rigid shell conforming with the contours of the mould and then shrinks internally, while the steam metal continues to feed, resulting in a satisfactorily dense inner portion with shrinkage depressions on the outside, that is, shrinkage depressions in the sprue and risers if the gating has been properly designed.

Another paper by the same authors, presented by Mr. Kihlgren, is entitled "Casting Properties of Nickel Bronzes." This brings together and correlates some previously published information and adds a good deal of new data illustrating the influence of small percentages of nickel on foundry brasses and bronzes. A large number of castings were made in various common alloys, using 0.5, 1.5 and 3.0 percent nickel and such properties as fluidity, density and grain size were measured. In some alloys, notably 88-10-2, nickel is found to have very little effect while in others the results are markedly beneficial. In some cases the maximum effect is produced by the addition of 0.5 percent nickel, in others an improvement is noted up to 1.5 percent nickel. In no case do these small percentages of nickel have a detrimental effect.

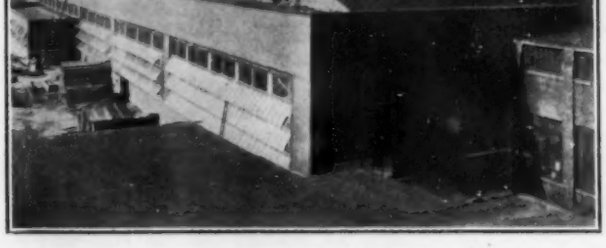
"Phosphorus in Red Brass" was the subject of a paper by R. W. Parsons of the Ohio Brass Company. It is the author's belief, based on his experience and upon a number of tests described in the paper, that phosphorus to the amount of 0.01 or 0.02 percent in the zinc-containing foundry alloys is in considerable excess and that previously published references to such percentages are probably in error. He finds that if sufficient phosphor-copper to produce such residues is used the metal becomes "wild" and uncontrollable, and the castings are defective. He also finds that the cuprous oxide present in virgin copper is one of the most serious sources of oxygen, for the removal of which the use of a suitable proportion of phosphorus is necessary. The paper was followed by much discussion, from which it could only be concluded that the use of phosphorus has been responsible for widely differing experiences. Possibly these have been due to other factors, the contributing effect of which is not well understood.

At a joint session of the A.F.A. with the A.S.M.E. a paper on "Materials Handling in the Small Brass Foundry" was presented by D. G. Anderson and B. F. McAuley of the Western Electric Company. The authors describe the installation and use of mechanical sand handling, electric melting, mould conveying, and special sand-blast barrels in a brass foundry of very moderate size. The point of special interest is that equipment of this type, ordinarily associated with rather large foundries, is, in this instance at last, profitably used in a foundry having a maximum melting capacity of perhaps 15,000 lbs. per day.

Anaconda Tube Plant in Canada To Operate Soon

THE Anaconda American Brass, Ltd., of New Toronto, Canada, will shortly embark on the manufacture of copper and brass tubes at the new New Toronto plant of the company where a large factory has been erected, which, with special machinery and additions, has cost $2,000,000. On July 1 the company will be in production in the new tube mill.

The first copper billet was pierced on April 12th, and they made their initial shipment during the next week. The production of brass and other copper alloys will follow at an early date. The floor space is roughly 400 ft. x 100 ft., and they estimate an ultimate production of upward of 750,000 pounds per month, in sizes ranging from ⅛" I.D. to 5½" O.D. The present demand is probably not quite half this figure, but should improve with any pick-up in business and normal growth in population. The copper, zinc, lead and nickel used are entirely of Canadian origin, so the product of the new department will be 100% Canadian.



New Anaconda Tube Mill at Toronto

Prizes for Articles in "Metal Industry"

In our issue for January, 1931, we announced for the second year, two prizes for original articles published in the METAL INDUSTRY during the calendar year (1931). The prizes were to be $50 each; one for the best article on metal manufacturing in any of its branches, and the other on metal coating.

The awards have now been made by the committees in whose hands the decision was left. For articles on metal manufacturing the committee was headed by **G. H. Clamer,** President of the Ajax Metal Company, and the other members were **H. M. St. John, W. J. Reardon** and **W. J. Pettis,** all Associate Editors of METAL INDUSTRY. The committee on metal coating articles consisted of **O. J. Sizelove, W. Fraine, Dr. A. K. Graham** and **G. B. Hogaboom,** Associate Editors of METAL INDUSTRY.

1931 Prize Winners

The winner of the prize for the best article on metal manufacturing was **R. J. Cowan** of the Surface Combustion Corporation, Toledo, Ohio, for the article **The Chemical Effect of Gaseous Atmospheres in the Bright Annealing of Metals,** published in our issue for August, 1931, page 333-335.

R. J. COWAN

Surface Combustion Corporation, Toledo, Ohio

The prize for the best article on metal coating was awarded to **F. F. Oplinger** of the Roessler and Hasslacher Chemical Company, Perth Amboy, N. J. His paper was **An Efficient Electro-Tinning Process,** published in our issue for December, 1931, page 529-532.

F. F. OPLINGER

Roessler and Hasslacher Chemical Company, Perth Amboy, N. J.

Other Articles of Merit

Naturally, neither of these choices was unanimous, recommendations having been made which included a number of other authors. We are glad therefore, to give honorable mention to the others who were named by the committees.

Metal Manufacturing

F. A. Westbrook, The Oxy-Acetylene Welding of Copper and Aluminum and Some of Their Alloys, October, 1931, page 424-425, and November, 1931, page 469-470.

Dr. R. J. Anderson, Smelting Secondary Aluminum and Aluminum Alloys, November, 1931, page 474-476; December, 1931, page 519-520.

R. R. Clarke, Fundamentals of Brass Foundry Practice, July, 1931, page 302-303; September, 1931, page 384-385.

Harry W. Dietert, Calculations for Molding in the Foundry, September, 1931, page 380-382.

Metal Coating

Otto H. Loven, Cleaning of Metals Before and After Plating, July, 1931, page 291-292; August, 1931, page 338-340.

Ray C. Martin, Synthetic Rosins, July, 1931, page 293-294.

I. L. Newell and W. H. Keefe, Analyzing Chromium Solutions, May, 1931, page 206-207.

Dr. Joseph Rossman, Plating with Rare Metals, June, 1931, page 245-246.

W. W. Rogers, The Coloring of Tin and Tin-Lead, and Aluminum Foils, August, 1931, page 341-343.

T. C. Eichstaedt, Plating and Finishing Electric Irons, February, 1931, page 69-71.

William E. Bailey, Correcting Engravings by Projected Electrolyte, August, 1931, page 344-345.

METAL INDUSTRY offers its congratulations to the winning contestants and its thanks to all of those who have contributed to its pages in the interest of the metal working and metal finishing industries. Thanks are also due to the members of the committees who made the awards, for their fair-minded, conscientious and painstaking study of the material under consideration.

Magnesium

By Dr. JOHN A. GANN

Chief Metallurgist, Dow Chemical Company, Midland, Mich.

A Review of Its Technology of Production and Uses*

FROM "MINING AND METALLURGY", APRIL, 1932

WITHIN a very few years magnesium has sprung from oblivion, from classification as a technically unknown, little appreciated, and expensive material to front-page importance in many fields of engineering.

History of Magnesium

Bunsen may be considered the real founder of our present magnesium industry. In 1852, he prepared this metal by the electrolysis of fused magnesium chloride in a porcelain crucible. In the following years the electrolytic process became recognized as superior to chemical reduction methods and Germany became the world's chief producer, installing the first electrolytic magnesium plant in 1886. Thirty years later, national defense requirements, occasioned by the outbreak of the World War and the cutting off of imports, caused France, England, and the United States to begin production. Most of this magnesium was used for military purposes so the close of the war resulted in a large curtailment in production. A few companies, however, encouraged by the early success of the Germans and by the rapid developments taking place in aeronautics, and confident in the certain future and ultimate value of this metal, undertook extensive researches in its production and utilization. A variety of production methods, both chemical and electrochemical, were investigated and some of them operated on a commercial scale. Reduction of the oxide with carbon at high temperatures and the electrolysis of the oxide in a fluoride bath were two of the more promising of the newer procedures. Reversal of the reaction $MgO + C = Mg + CO$ occurred in the former, and the second method was hindered by a very low solubility of magnesium oxide in the electrolytic bath. These and other technical difficulties, coupled with the necessity of distilling or otherwise purifying the metal, and the low over-all economy of operation finally resulted in abandonment of both methods. The electrolysis of anhydrous magnesium chloride is now universally used and appears to be the basic industrial method of the future.

Our American magnesium industry really dates from 1915, since an earlier Boston enterprise was not entirely successful and had long since been discontinued. The General Electric Company at Schenectady was the first of the new producers. The Norton Laboratories at Nashua, N. H., and later at Lockport, N. Y., and the Electric Reduction Company of New York City likewise produced magnesium during the latter part of 1915. Production was begun in this same year by the Shawinigan Electro Metals Company, Ltd., at Shawinigan Falls, Canada. The next few years witnessed the appearance of several new companies including the Aviation Materials Corporation, Niagara Falls, N. Y.; The Magnesium Manufacturing Corporation at Rumford, Me.; The American Magnesium Corporation at Niagara Falls, N. Y.; and The Dow Chemical Company at Midland, Mich.; and likewise the elimination of several names from the producers' list due to cessation of operations or to consolidation with others. In 1917 there were five producers, but by 1920 only two remained, The American Magnesium Corporation and The Dow Chemical Company.

The use of German magnesium began to increase about this time. Cheap labor in an established industry allowed it to be imported at a price lower than the domestic cost of production. In 1922, the volume of these imports was more than three times as large as the consumption of domestic magnesium. The American industry might have been greatly retarded, if not completely strangled, had it not been for the protective tariff imposed on the metal during this same year. Two years later (1924) came the suspension of operations by the Elektron Metals Corporation, which had been formed to exploit the German product in this country. In May, 1927, the American Magnesium Corporation ceased the manufacture of ingot metal and confined its activities primarily to the casting and fabrication of magnesium and its alloys. Within the last few weeks the American Magnesium Corporation and the German I. G. Farbenindustrie are reported to have united in the cause of magnesium.

Extraction of Magnesium from the Chloride

The Dow Chemical Company's entry into the magnesium industry in 1916 was due primarily to the abundant supply of magnesium chloride in the salt brine that forms the raw material for its various chemical processes. Two problems presented themselves: the development of a method for converting this magnesium chloride into a suitable cell-feed material and the development of a suitable electrolytic cell. These two problems were attacked simultaneously by different groups of investigators, as the progress in one often depended on the success of the other.

Magnesium chloride normally contains six molecules of water of crystallization, a portion of which water would be decomposed in an electrolytic cell, thereby needlessly consuming power, and another portion would instigate a number of undesirable chemical reactions. The obvious solution of the problem was to remove the water by drying, but direct heating resulted in a decomposition of magnesium chloride into magnesium oxide by its interaction with its own water of crystallization. This necessitated the adoption of indirect dehydration methods.

The first method chosen for making anhydrous magnesium chloride was the so-called sal ammoniac process,

* Abstract of an address presented at the annual meeting in New York, Feb. 16, 1932.

forming a double magnesium-ammonium chloride which could be fused to form anhydrous magnesium chloride. This was electrolyzed in a crude soapstone-lined cell, with an iron plate and graphite rod for electrodes. Much to our surprise the cell actually "ran" when it was first started and began to produce magnesium metal which appeared as small globules floating in the molten salt bath. The current was approximately 120 amperes at a potential of 10 to 12 volts. Continued operation of this cell taught several important lessons. The addition of common salt to the magnesium chloride not only lowered its melting point, but also increased its conductivity. The addition of a little fluorspar to the cell helped to coalesce the small globules of molten magnesium to a large mass, thus facilitating its removal from the cell. It was also discovered that the best way to remelt the magnesium was to use some of the fused cell bath as a flux. This procedure with certain refinements forms the basis of present-day melting and scrap reclamation processes.

Early Struggles

After the first experimental cell had been operated for some weeks and had fulfilled its mission, a semi-plant unit was constructed. This consisted of a 400-ampere cell and setting, a low voltage motor generator set, a brick furnace and subliming chamber for the production of anhydrous magnesium chloride, and a melting pot for remelting and purifying the magnesium. This unit was operated more or less continuously for several months with varying success. When things went smoothly, as much as 10 to 12 lb. of metal were made in a day; at other times polarization of the anodes caused considerable trouble. The remedy for this was simple enough after once discovered. It consisted in maintaining the cell bath in a suitably fluid condition by holding the proportions of magnesium chloride and sodium chloride between the limits of approximately 40 to 60 per cent of each. The escape of chlorine gas was another difficulty. Sometimes it persisted in boiling out of the anode compartment in spite of all precautions and soon filled the room to such an extent that everyone was driven out. Lastly, during the fall and winter everything in the building became coated with a dirty, slimy coat of magnesium chloride.

Finally it was decided to build a commercial plant and soon some very fine designs for a plant appeared on the drafting board. It was proposed to install a unit of 25 cells in series so as to be able to use the 300-volt d. c. current available in the plant. Each was to hold 300 to 400 lb. of molten salt. Dehydration was to be accomplished in a large internally-fired rotary kiln dryer and a battery of 8-ft. cast-iron fusion pots, for the final dehydration. The plant started in the fall of 1917 but it was not long before difficulties began to develop. Some of the cells became too hot, while others persisted in freezing up. Some of the cells were short-circuited by the accumulation of metal in them. Chlorine leaks occurred and made the air almost unbearable for the workmen. Finally a few cell-pot castings cracked and allowed the molten charge to run out on the floor. Nothing could be done but to cut out those cells and continue with the survivors. Herculean efforts at last failed to keep the plant in condition and a shutdown resulted.

The experience showed that the sal ammoniac process for producing anhydrous magnesium chloride was beset with many objections. The ammonium chloride recovery was poor, the equipment for handling ammonium chloride solution suffered from corrosion, and the fusion pots had a short life. The plant was therefore dismantled.

The next cell developed was both simple in design and a success, inasmuch as it could be operated for weeks at a time without a breakdown. It consisted of a round bottom, cast steel pot that served as the cathode. A large graphite electrode was suspended centrally in the pot and the fireclay flue liner surrounding the anode formed a chamber for collecting the chlorine gas. This cell held approximately 800 lb. of molten cell bath, operated on 3,000 amperes, and produced 50 to 60 lb. of magnesium per day. The feed was made by the so-called "double-salt" method, and the resultant product contained approximately 60 per cent magnesium chloride and 40 per cent sodium chloride. The use of this "double salt" as a cell feed resulted in an accumulation of sodium chloride so that continuous operation necessitated periodic dipping of part of the cell-bath back into the fusion kettle and replenishing with fresh feed.

The success of this new cell soon prompted the construction of a new plant. Another series of magnesium cells and fusion kettles was provided, together with all necessary equipment. The plant was operated for several weeks at a current efficiency of 60 to 70 per cent, which was considered fairly successful at the time. The finish of this second plant came with almost dramatic suddenness. One morning one of the large fusion kettles cracked open and allowed its charge of hot molten salt to run out across the floor. Wooden roof supports and working platforms in the path of this hot salt were immediately set on fire and the entire building was gutted.

The suddenness with which this catastrophe came was another serious setback in the slow and faltering progress in the development of magnesium manufacture at Midland. When the curtain finally did rise again we found another series of four or five of the 3,000-ampere cells set up with some structural improvements and this time thriving on a feed of anhydrous magnesium chloride instead of the mixed chloride, thus eliminating the dipping evil. This material was the product of another extensive research investigation and was prepared from the hydrated salt by partially drying the latter in air and completing the dehydration in an atmosphere of hydrochloric acid gas. This gas frequently escaped and a mixture of hydrochloric acid and chlorine gases cannot be recommended to any one as an atmosphere in which to work. The cells, however, were kept in continuous operation for a period of months and required relatively little supervision or operating labor. Once more, increased production was planned, but had to be given up because of the financial crash of 1920. Curtailment, not expansion, followed, and within a few months all production activities stopped. We then had on hand the magnificent amount of 20,000 lb. of magnesium which proved sufficient inventory to meet all requirements for over a year.

Commercial Production

Production on a small scale was again started late in the fall of 1921 using the process of manufacture last described, but the demand continued to be small until after the 1922 tariff became effective. During this period and the few years following, many improvements were made, but the development of larger units could not come until the market for magnesium had been developed to the point where a large production was practical. The last few years have witnessed such changes. Individual units in certain stages of our present dehydration process have capacities equivalent to better than 20,000 lb. of metal per day. Cells of many thousand ampere capacity have been developed and successfully operated. The use of these large commercial cells has permitted many refinements hardly dreamed possible in the smaller units, such improvements being reflected in a purer, cheaper metal.

A condensed outline of the process thus developed is

given in the flowsheet shown in Fig. 1. The brine containing magnesium chloride, calcium chloride, and sodium chloride is treated with magnesium hydrate slurry to precipitate iron and other impurities which are removed in sedimentation tanks. The salt (sodium chloride) is next separated by evaporation and filtration. Further evaporation, coupled with a series of fractional crystallization steps, separates the calcium chloride from the magnesium chloride. These magnesium chloride crystals contain over 50 per cent water corresponding to their six molecules of water of crystallization. Air drying on the counter-current principle at a temperature below that of incipient fusion removes about two-thirds of this water. The final drying must be done in an atmosphere of hot hydrochloric acid

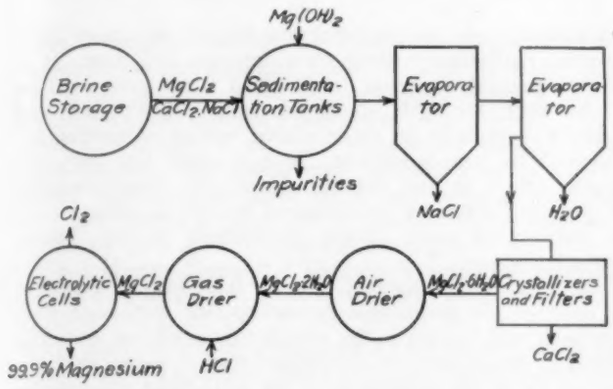


Fig. 1. Outline flowsheet of the process developed for magnesium production

gas to prevent excessive hydrolysis and magnesium oxide formation.

A battery of electrolytic cells is shown in Fig. 2. They consist of large rectangular cast steel pots. The lower portions of these cells are submerged below the operating floor level and are built into stoker-fired furnaces that help to maintain the proper cell temperature and reduce the power consumption. The steel pot serves as the cathode and a series of graphite rods forms the anode. The electrolytic process is a continuous operation. The cell bath is maintained at the correct level by a continuous or intermittent feed of magnesium chloride which enters through the sloping pipe at the front of the cell.

The small globules of magnesium form on the side of the cathode and then rise to the surface of the cell bath where they collect into a coherent mass. Metal is periodically dipped from the cells and cast into ingots. This magnesium without further treatment analyzes better than 99.9 per cent pure and thus constitutes one of our purest commercial metals. The average analysis of this magnesium shows the presence of the following impurities: Aluminum, 0.030 per cent; iron, 0.034; manganese, 0.002; and silicon, 0.015 per cent; a total of 0.081.

The quality of the metal is due primarily to the purity of the cell feed, the absence of appreciable attack of magnesium on the cell parts, and to the washing or purifying action of the cell bath that behaves as a flux to remove possible nonmetallic contaminations.

One of the outstanding effects of the growth of the magnesium industry in this country was the rapid decrease in the cost of the metal. In 1915 ingot magnesium sold for $5 and more per pound. Seventeen years of effort have cut this cost to 30c. per pound, or one-seventeenth of the former value. At this figure the sales price of magnesium compares favorably with that of other metals of time-honored usage. It is now able to compete successfully in Europe against the German product. The consumption of domestic magnesium increased as the cost decreased, but the ratio has shown several irregularities owing to economic conditions. One of the important factors contributing to the world-wide interest now shown in magnesium is its low cost per unit volume. Nickel is slightly less than $200 per cu. ft.; tin about $100; copper about $40; aluminum about $38; magnesium about $30; lead about $25; zinc, $15, and iron around $5.

Ores Available.

One of the first inquiries of the industrialist interested in the extended use of a given commodity is directed toward the availability of necessary raw materials and how this affects the possibility of large scale production. In the earth's crust, magnesium is the third most abundant of our engineering metals, being surpassed in quantity

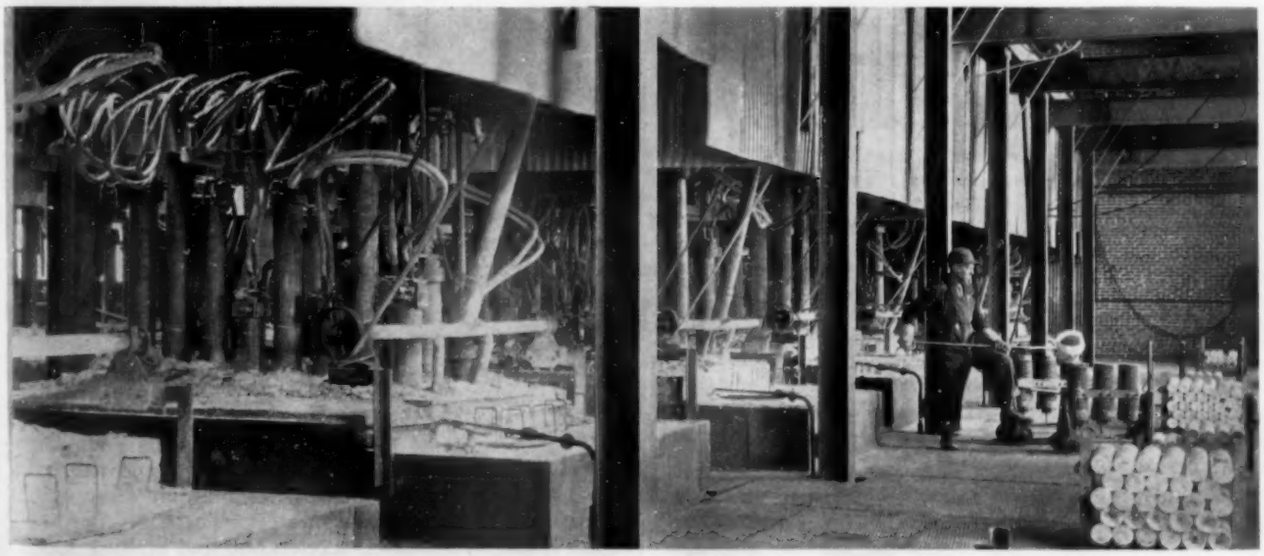


FIG. 2. BATTERY OF ELECTROLYTIC CELLS

only by aluminum and iron. Magnesium is not only a large constituent of the earth's crust, but also occurs as compounds that find direct use in industry or that are readily converted into other useful compounds. Table 1 lists the more important magnesium compounds, their sources and a few of their uses. The supply of raw materials for the manufacture of magnesium is practically inexhaustible.

TABLE 1. MAGNESIUM COMPOUNDS

Compound	Sources	Uses
Magnesium chloride	Carnallite	Magnesium metal
	Brines	Rayon
		Oxychloride cement
Magnesium sulfate	Kieserite	Pharmaceuticals
		Leather
		Rayon
		Oxysulfate cement
Magnesium oxide	Brucite	Refractories
		Pharmaceuticals
Magnesium carbonate	Magnesite	Pipe covering
	Dolomite	Paper
		Paints
Silicates	Asbestos	Refractories
	Talc	Rubber
		Pharmaceuticals
Miscellaneous salts	Synthetic	Pharmaceuticals
		Insecticides

Uses of Magnesium

The application of magnesium chloride and magnesium sulfate in the production of plastic cements is of interest. When magnesium oxide is mixed with strong aqueous solutions of these salts, interactions occur with the formation of oxychlorides and oxysulfates, respectively, that have the property of setting like cement. These synthetic cements form the basis of stuccos, flooring, synthetic wood, and sound-absorbing materials.

TABLE 2. USES OF MAGNESIUM

1. Pyrotechnics	Flares
	Signals
2. Chemicals	Grignard reaction
3. Deoxidizers	Nickel
	Nickel alloys
4. Alloying ingredients	Aluminum alloys
	Zinc die-casting alloys
5. Structural material	Ultra-light alloys
	Castings
	Wrought shapes

TABLE 3. PROPERTIES OF MAGNESIUM ALLOYS

Alloy	Condition	Tensile Strength, lb. per sq. in.	Yield Point, lb. per sq. in.	Per Cent Elongation in 2 in.	Brinell Hardness
Magnesium	Cast	17-21,000	2-3,000	8-12	32-36
Dowmetal E	Cast	28-31,000	7-8,000	9-12	46-50
Dowmetal A	Cast-H.T.	31-35,000	8-10,000	9-12	48-52
Dowmetal G	Cast-H.T.	33-38,000	17-20,000	1-3	70-80
Magnesium	Extruded	27-30,000	10-12,000	6-9	35-38
Dowmetal F	Extruded	37-41,000	26-30,000	12-16	45-50
Dowmetal A	Extruded	42-48,000	28-32,000	8-12	54-58

The metal magnesium is used commercially in five distinct fields (Table 2). Pyrotechnics created the first demand and are primarily responsible for starting our United States industry. For years the layman was acquainted with this metal only in the form of flashlight powder and to him the terms "flashlight powder" and "magnesium" became practically synonymous expressions.

The Grignard reaction employing magnesium is used in the synthesis of a wide variety of organic chemicals. This offers a valuable means for preparing certain complex medicinal and perfumery compounds.

The importance of magnesium as a deoxidizer and scavenger is well known in the metallurgical world, especially in the nickel and nickel alloy industry. Additions of approximately 0.1 per cent magnesium make these metals sufficiently malleable to permit fabrication by mechanical working operations. Its efficiency depends largely on the strong electropositive character of the metal and its enormous affinity for oxygen at high temperatures.

Magnesium Alloys and Their Applications

Magnesium is an essential constituent of many alloy systems, particularly those of aluminum and zinc. It is used in amounts ranging from ¼ to 2 per cent in most of the high strength aluminum alloys, both cast and wrought, especially in those alloys whose properties are improved by heat-treatment. It is a small but very important factor in zinc die-casting alloys. Approximately 0.1 per cent exerts a pronounced beneficial influence on the stability of these alloys, particularly in hot, humid atmospheres.

The four uses mentioned thus far have been responsible for most of the magnesium consumption. Although they have been real factors in the establishment of our domestic industry, the important developments of today and tomorrow lie in the utilization of the ultra-light magnesium alloys as structural metals. The outstanding characteristic of magnesium is its extreme lightness, a quality that distinguishes it from all other engineering metals. Beryllium is almost as light as magnesium, but at present cannot be classed as an engineering material. Magnesium is two-thirds the weight of aluminum, one-fourth the weight of zinc or cast iron, and one-fifth the weight of copper or nickel. Such lightness coupled with good strength in a single metal is one of the demands of the transportation engineer and of the user of portable and hand operated equipment. Pure magnesium does not meet these combined specifications and the development of valuable high strength magnesium alloys constitutes one of the worth while contributions of modern metallurgy. Concrete data are given in Table 3. In some instances the tensile strength and hardness have been approximately doubled and the yield point increased sixfold over the corresponding values for the pure metal. All of these alloys are characterized by their high ratio of fatigue endurance to weight. Special alloys have been developed for specific purposes. Some have high thermal properties, others resistance towards salt water; all are free from inter-crystalline corrosion.

Methods for casting, heat-treatment, and mechanically working these alloys have advanced to the point where these operations are now conducted on a commercial scale. Sand, permanent-mold, and die-castings are readily obtained. The alloys are fabricated to practically all standard sizes of rods, angles and shapes. Ease of machining is a big asset in the finishing of articles. Final assembling is done by riveting and spot or gas welding. Castings are used in crankcases, housings, wheels and the like. Pilot seats and tanks are constructed largely by welding sheet metal. Airplane fuel tanks constitute a wide application for sheet metal and magnesium chairs have met with wide approval. Truck trailers made of magnesium alloy weigh half as much as when made of steel. Their improved operation is due to increased acceleration and braking speed, high traveling speed, lighter and cheaper motor power, and increased pay load.

Standard Classification for Old Metals

The Following Standard Classification for Old Metals Has Been Adopted by the National Association of Waste Material Dealers, Inc., New York, Effective from March 16th, 1932

No. 1 Copper Wire. To consist of clean untinned copper wire not smaller than No. 16 B. & S. Wire gauge to be free from burnt copper wire which is brittle and all foreign substances.

No. 2 Copper Wire. To consist of miscellaneous clean copper wire which may contain a percentage of tinned wire and soldered ends, but to be free of hair wire and burnt wire which is brittle; the tinned wire not to be over 15% of the total weight.

No. 1 Heavy Copper. This shall consist of untinned copper not less than 1-16 inch thick, and may include Trolley Wire, Heavy Field Wire, Heavy Armature Wire, that is not tangled, and also new untinned and clean copper clippings and punchings, and copper segments that are clean.

Mixed Heavy Copper. May consist of tinned and untinned copper, consisting of copper clippings, clean copper pipe and tubing, copper wire free of hair wire and burnt and brittle wire, free from nickel plated material.

Light Copper. May consist of the bottoms of kettles and boilers, bath tub linings, hair wire, burnt copper wire which is brittle, roofing copper and similar copper, free from radiators, brass, lead and solder connections, readily removable iron, old electrotype shells and free of excessive paint, tar and scale.

Composition or Red Brass. May consist of red scrap brass, valves, machinery bearings and other parts of machinery, including miscellaneous castings made of copper, tin, zinc and/or lead, no piece to measure more than 12 inches over any one part or to weigh over 60 lbs., to be free of railroad boxes, and other similarly excessively leaded material, cocks and faucets, gates, pot pieces, ingots and burned brass, aluminum composition, manganese and iron.

Railroad Bearing. Shall consist of railroad boxes or car journal bearings, must be old standard used scrap, free of yellow boxes, also iron-backed boxes, and must be free of babbitt, also free of excessive grease and dirt.

Cocks and Faucets. To be mixed clean red and yellow brass, free of gas cocks and beer faucets, and to contain a minimum of 35 per cent red.

Heavy Yellow Brass. May consist of heavy brass castings, rolled brass, rod brass ends, chandelier brass, tubing, not to contain over 15% of tinned and/or nickel plated material; no piece to measure more than 12 inches over any one part and must be in pieces not too large for crucibles. Must be free of manganese mixture, condenser tubes, iron, dirt and excessive corroded tubing. Must be free of aluminum brass containing over 0.20% aluminum.

Yellow Brass Castings. Shall consist of brass castings in crucible shape, that is, no piece to measure more than 12 inches over any one part; must be free of manganese mixtures, tinned and nickel plated material, and must be free of visible aluminum brass.

Light Brass. May consist of miscellaneous brass, tinned or nickel plated that is too light for heavy brass, to be free of gun shells containing paper, ashes or iron, loaded lamp bases, clock works and automobile gaskets. Free of visible iron unless otherwise specified.

Old Rolled Brass. May consist exclusively of old pieces of sheet brass and pipe free from solder, tinned and nickel plated material, iron, paint and corrosion, ship sheathing, rod brass, condenser tubes and Muntz metal material.

New Brass Clippings. Shall consist of the cuttings of new sheet brass to be absolutely clean and free from any foreign substances and not to contain more than 10% of clean brass punchings to be not smaller than ¼" in diameter.

Brass Pipe. Shall consist of brass pipe, free of nickel plated, tinned, soldered or pipes with cast brass connections. To be sound, clean pipes free of sediment and condenser tubes.

No. 1 Red Composition Turnings. To be free of railroad car box turnings and similarly excessively leaded material, aluminum, manganese and yellow brass turnings; not to contain over 2% free iron; to be free of grindings and foreign material, especially babbitt. Turnings not according to this specification, to be sold subject to sample.

No. 1 Yellow Rod Brass Turnings. Shall consist of strictly rod turnings, free of aluminum, manganese, composition, Tobin and Muntz metal turnings; not to contain over 3% free iron, oil or other moisture; to be free of grindings and babbitts; to contain not more than 0.30% tin and not more than 0.15% combined iron.

No. 1 Yellow Brass Turnings. Shall consist of yellow brass turnings, free of aluminum, manganese and composition turnings; not to contain over 3% of free iron, oil or other moisture; to be free of grindings and babbitts. To avoid dispute, to be sold subject to sample.

Auto Radiators (Unsweated). All radiators to be subject to reduction of actual iron. The tonnage specification should cover the gross weight of the radiators, unless otherwise specified.

No. 1 Pewter. Shall consist of tableware and soda fountain boxes, but in any case must test 84 per cent tin. Siphon tops to be treated for separately.

Zinc. Must consist of clean sheet and cast zinc, also cast batteries to be free of loose oxide and dross, salammoniac cans and other foreign materials.

Zinc Dross. Must be unsweated in slabs and must contain a minimum of 92% of zinc.

Tin Foil. Shall consist of pure foil free of lead

compositions and other foreign ingredients and matters.

Electrotype Shells. Must be hand picked and free of loose dross and chunks of dross.

Scrap Lead. Should be clean, soft scrap lead.

Battery Lead Plates. (a) Shall consist of dry battery lead plates, moisture not to exceed 1 per cent, allowance to be made for wood, rubber and paper and excess moisture, or

(b) Lead plus antimony content, dry basis, less a treatment charge.

Note:—Contracts covering this item should specify which method is to be used as a basis of settlement.

New Pure Aluminum Clippings. Shall consist of new, clean, unalloyed sheet clippings and/or aluminum sheet cuttings. Must be free from oil, grease, and any other foreign substance. Also to be free from punchings less than one-half inch square.

New Pure Aluminum Wire and Cable. Shall consist of new, clean, dry, unalloyed aluminum wire or cable, free from iron, insulation and any other foreign substance.

Old Pure Aluminum Wire and Cable. Shall consist of old, unalloyed aluminum wire or cable containing not over 1 per cent free oxide or dirt and free from iron, insulation and any other foreign substance.

Alloy Sheet Aluminum. To be sold on specification and sample.

Painted Sheet Aluminum. Shall consist of clean, old, painted, unalloyed sheet aluminum, guaranteed free from iron, dirt, and any other foreign substance. To contain no radiator shells or aeroplane sheet.

Old Scrap Sheet Aluminum. Shall consist of clean, old, unalloyed sheet or manufactured sheet aluminum, guaranteed free from iron, dirt, or any other foreign substance, and to be free from hub caps, radiator shells and aeroplane sheet.

Scrap Aluminum Castings. Shall consist of clean, heavy automobile castings, containing not more than 12 per cent industrial mixed castings, and to be free from die cast aluminum, pattern metal and hat blocks. All of above material also to be free from iron, babbitt, brass and any other foreign substance. Oil and grease must not exceed 2 per cent.

Aluminum Borings. To avoid dispute, should be sold subject to sample.

Aluminum Foil. Shall consist of Pure Aluminum Foil, free from paper and any foreign ingredients.

Babbitt Metal. Shall contain bearing metal of all kinds. Shall not contain scrap hard metal, Allen metal (which is copper and lead alloy) die cast, ornamental metal, casket metal, zinc boxes or type metal.

Volume Changes in Metals During Casting

THE American Foundrymen's Association and the Bureau of Standards have been cooperating in a study of the shrinkage of metals during casting and the influence of such shrinkage on the production of sound castings. This work was reported in the January number of the "Bureau of Standards Journal of Research."

The total shrinkage of a metal or alloy for casting purposes has a profound influence on the foundry practice for that particular metal. It affects the size of the pattern required to give a casting of definite dimensions (pattern-maker's shrinkage), the design of a casting, the size, type, and location of risers and feeders needed, the liability of castings to crack in the mold, and the soundness of a pressure test.

The present paper describes a method which has been developed for measuring the volume changes undergone by a metal or alloy with change in temperature as it cools from any temperature in the liquid state to ordinary temperatures. It defines as the three types of shrinkage to be considered: (1) Shrinkage of the metal in the liquid state, (2) shrinkage during solidification, and (3) shrinkage in the solid state; and considers in detail the sand-cast cone method for determining shrink-age during casting and the more fundamental procedure of constructing a specific volume temperature curve for each metal or alloy from some temperature well above the melting point or range to room temperature.

The specific volume-temperature curve for liquid metal is constructed from data secured by application of the crucible immersion method; that is, by filling a crucible of known volume with the liquid metal at known temperature. Since the mass of the sample of liquid metal is the same as that of the sample at room temperature, the liquid specific volume may be readily calculated.

Data on the contraction of solid metal were obtained by means of direct observations of the change in length with change in temperature of a sand-cast bar of metal.

The difference between the specific volume of the liquid metal and of the solid metal at the melting point is the volume shrinkage undergone during solidification. In the case of an alloy, shrinkage during solidification occurs over a range of temperature.

Shrinkage data are given for a number of non-ferrous metals and a cast iron.

Die Casting Developments

By W. N. Pierce*

Chief, Metal Research Division, The New Jersey Zinc Company, Palmerton, Pa.

Developments in the die casting industry have proceeded along two lines, metallurgical and mechanical. Metallurgical progress has brought about the stabilization of the zinc base alloy in general use (92.9 zinc, 4 aluminum, 3 copper, 0.1 magnesium). The alloy is now known to be strong, stable and to take any kind of a finish, providing high grade zinc is used.

Mechanical development has been largely along the line of much higher pressure, which has permitted the use of lower casting temperatures, thus decreasing porosity and giving a stronger, sounder casting.

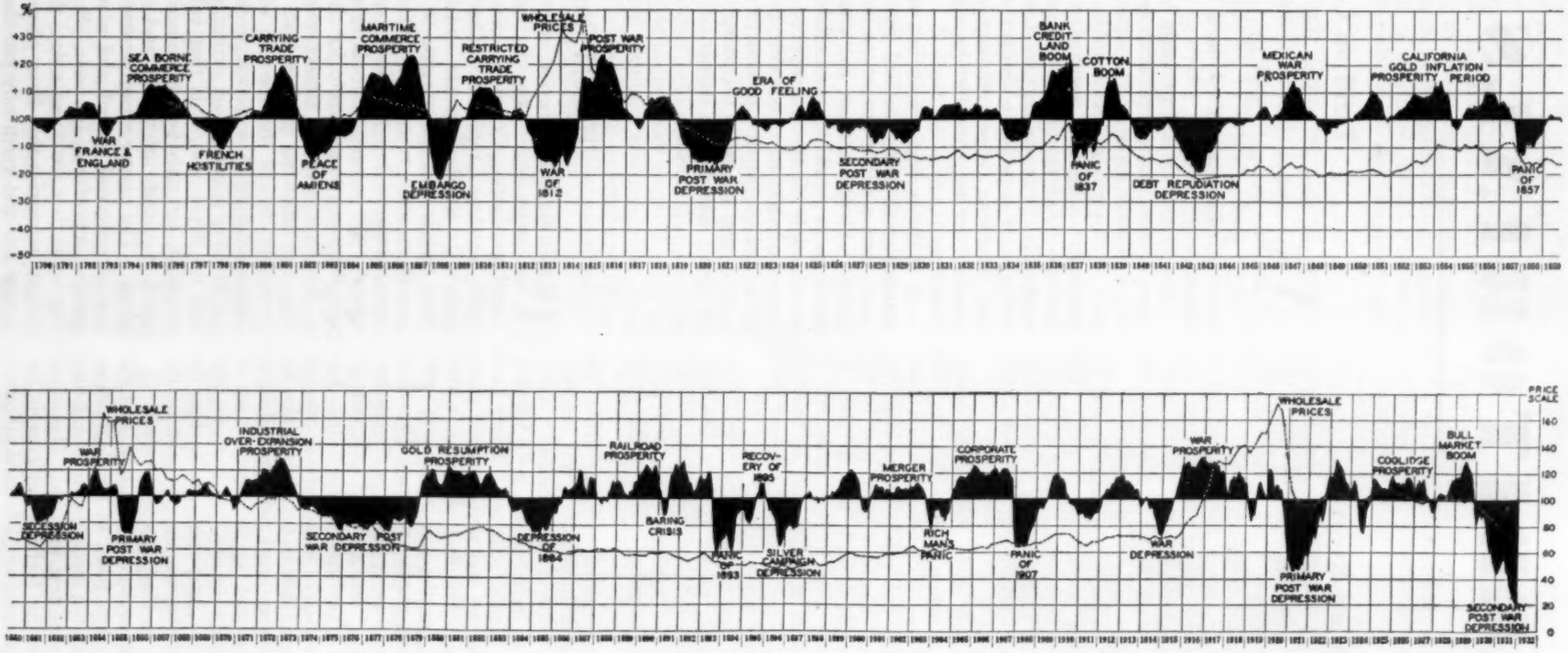
Brass die castings will probably come into limited competition with zinc base alloys but there are still many new fields for zinc to fill.

The plating and finishing of zinc base die castings has improved greatly in the past few years and will continue to make progress. Further progress is also expected in new and improved alloys.

*A paper read at the 14th Annual Meeting of the American Zinc Institute at St. Louis, Mo., April 18, 1932.

Booms and Depressions from 1790 to 1932

A Chart by Col. Leonard P. Ayres of the Cleveland Trust Company Showing How American Business Has Fared During the 142 Years the United States Has Been an Independent Nation


%
+30
+20
+10
NOR
-10
-20
-30
-40
-50
WAR FRANCE & ENGLAND
SEA BORNE COMMERCE PROSPERITY
FRENCH HOSTILITIES
CARRYING TRADE PROSPERITY
PEACE OF AMIENS
MARITIME COMMERCE PROSPERITY
EMBARGO DEPRESSION
RESTRICTED CARRYING TRADE PROSPERITY
WHOLESALE PRICES
WAR OF 1812
POST WAR PROSPERITY
PRIMARY POST WAR DEPRESSION
ERA OF GOOD FEELING
SECONDARY POST WAR DEPRESSION
BANK CREDIT LAND BOOM
PANIC OF 1837
COTTON BOOM
DEBT REPUDIATION DEPRESSION
MEXICAN WAR PROSPERITY
CALIFORNIA GOLD INFLATION PROSPERITY PERIOD
PANIC OF 1857
1790 1791 1792 1793 1794 1795 1796 1797 1798 1799 1800 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859
WHOLESALE PRICES
WAR PROSPERITY
SECESSION DEPRESSION
PRIMARY POST WAR DEPRESSION
INDUSTRIAL OVER-EXPANSION PROSPERITY
SECONDARY POST WAR DEPRESSION
GOLD RESUMPTION PROSPERITY
DEPRESSION OF 1884
RAILROAD PROSPERITY
BARING CRISIS
PANIC OF 1893
RECOVERY OF 1895
SILVER CAMPAIGN DEPRESSION
MERGER PROSPERITY
RICH MAN'S PANIC
CORPORATE PROSPERITY
PANIC OF 1907
WAR PROSPERITY
WAR DEPRESSION
WHOLESALE PRICES
PRIMARY POST WAR DEPRESSION
COOLIDGE PROSPERITY
BULL MARKET BOOM
SECONDARY POST WAR DEPRESSION
PRICE SCALE
160
140
120
100
80
60
40
20
0
1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932

THE above chart is broken in two for reasons of space, but it is in reality one continuous graph. It shows at a glance how business in the United States has never remained at any level, either normal or abnormal, for any length of time. It has always been either on the uptrend or the downtrend.

It should be borne in mind, however, that the black peaks and valleys show the condition as it applied to the particular period. If a graphic curve for the volume of American business were to be drawn, it would start very low at the extreme left end of the top half of the chart and steadily soar (with slight, momentary declines along the way) up to a very high point at the extreme right end of the lower half. The present state of affairs (1930-32) would in such a chart be one of the intermediate declines on the way up, presumably, although the exact dimensions of such a curve could not be determined until the end of the year, and the full curve not until the upturn had arrived.

Col. Ayres calls the present situation the Secondary Post-War Depression. Looking back along the chart, it appears that a similar period was experienced from the end of 1873 to the middle of 1879. That, however, was a depression practically confined to this country, whereas the present depression is worldwide.

Editorial Contents and particulars on advertising page 4 (before text); Buyers' Guide on advertising page 45 (after text pages).

EDITORIALS

Progress Toward Recovery

CONGRESS has struggled, but made progress—all too slowly perhaps. We are now assured of a balanced budget and reduced outlays. We should all like to see Government expenses and taxes cut in half. There has been an insistent demand, never before equalled in this generation, for lowering the cost of Government. But evidently some things are impossible, such as for example, 30 to 40 per cent cuts in the budget. However, we must be thankful for whatever favors we receive.

Some industries have had to submit to taxation and we have heard wails of pain and predictions of ruin. The pain is no doubt genuine but predictions of ruin are rarely to be taken at their own full valuation. It is unpleasant to be taxed but we must all submit and pay our share. The budget had to be balanced.

Business credit is now much easier due to the operations of the Federal Reconstruction Corporation and the Federal Reserve Board. There is, however, much complaint in certain quarters that this credit is not reaching the small and medium sized business man, due to the bankers' timidity. This condition must be corrected, as the small to middling business is an indispensable part of every industry. Those bankers at fault must be brought to time—perhaps by Federal Reserve authorities—as their own dangers have now been eliminated.

But there is still another step to take—the stimulation of buying. Public purchasing power is at a low ebb, due to widespread and protracted unemployment. Commercial credit alone is useless without sales, and sales must spring from public consumption. How is this to be stimulated?

We have had many suggestions ranging from the printing of fiat money for distribution among war veterans to large bond issues of the Federal Government. Needless to say, these suggestions included the usual number of unsound, impossible and fanatic schemes. There have been, however, some conservative and well-reasoned plans brought forth, among them a building program, within reasonable limits as to size, for the construction of self-liquidating, income-producing public works. President Hoover has expressed himself as opposed to "squandering ourselves into prosperity," but a sound program of building, properly financed (perhaps through the Reconstruction Finance Corporation), which would pay for itself and carry its own cost, should certainly gain his approval. There are, in addition, many other possibilities for doing commendable work such as the cleaning up of our city streets, and dump heaps, in outlying sections, and beautifying our parks, like the interesting work done by Dr. Langmuir (a brother of the famous physicist of the General Electric Company) in Hastings-on-Hudson.

Summer is normally a dull season in industry, and the coming summer may see the low point of the depression. There is much distress among the unemployed and it may become deeper during the next few months. This must be relieved. There is a growing feeling that now is the phychological time to take concrete steps toward stimulating a revival in public buying.

Tariff on Copper

AT the time of writing this editorial the Senate has approved a four-cent duty on imported copper. If this duty passes through the Congress as a whole, there will be wide changes in the copper producing and consuming industries in the United States and throughout the world.

The first effect will probably be the end of Copper Exporters, Inc., the co-operative export selling organization for American copper. It means also, quite definitely, the end of cooperation between American and foreign copper producers. Another result should be increased profits—perhaps slowly at first—for American copper producers; especially those having no foreign investments or interests. It is probable also that there will be a decline in the American copper refining industry, unless plans are worked out to refine foreign copper in bond, for re-export only.

It is the opinion of such a well known statistical organization as the Standard Statistics Company, that not more than a slight immediate increase in domestic copper prices will result from the enactment of the protective tariff, even should the rate established be sufficiently high to eliminate all foreign copper. The influence of a tariff over the longer term, however, probably will be moderately beneficial to domestic producers.

Our own advice, in the present muddled state of affairs, is—don't speculate in copper or copper stocks.

Uphold Quality

IN this distressing period, there is a business evil growing under cover—the decline in quality in manufactured products. Prices of raw materials have dropped with disastrous rapidity. Manufactured articles had to follow the trend, of course, and the resultant pressure has been terrific. In the struggle to keep abreast of the times—and in some cases ahead of them—many less careful manufacturers are sacrificing quality in order to meet prices. We mince no words in stating that such a policy is a long step toward ruin for the firm practicing it.

We have seen no clearer exposition of this situation than the following excerpt from an address by Benjamin Schwartz, before the meeting of the Pewter and Silver Manufacturing Association, recently held in New York.

"If there is one lesson manufacturers have learned during the depression, it is that volume of business as well as profit, can only be maintained today through improvement in quality of goods, and not through price appeal alone. The pewter manufacturers have an excellent product of universal appeal and a wonderful opportunity to conduct a profitable business. But if they persist in carrying on as they are doing today, they will go the way of all infant industries that have played around as if they had a new toy and eventually put themselves out of business.

"Quality has been consistently cheapened and the ap-

peal has been to price alone; this condition has been aggravated by the piracy of designs so that no manufacturer, who may make a contribution to the raising of the standards or the quality of his industry, can feel safe. . . The ultimate result from the lowering of quality standards, brought about by cut-throat price competition, will be to make the purchasing public sick and tired of the product."

There is only one way to retain the respect of, and to continue business relations with customers—to uphold quality. Every reduction in the standard of a product is a stone cut out of the foundation of the business house.

Corrosion Testing

THERE are many requirements which metals and alloys have to meet in service, but there is one which stands out above all the others—resistance to corrosion. Corrosion has been, for decades, recognized as the greatest enemy of metals; the cause of the heaviest losses to industry and consumers of metal products.

In the war against corrosion, the most important weapons are testing methods. We cannot fight corrosion, we cannot develop new alloys to resist corrosion, without being able to test these materials under the conditions which they will have to stand in service.

What is the strength of this weapon? Strangely enough, it is very weak. A short quotation from the report of Committee A-5 of the American Society for Testing Materials (Proceedings, 1931, page 171) makes our shortcomings clear.

"This Sub-Committee (VI on Specifications for Metallic-Coated Products) has continued its study of wire and wire products. . . . A special committee . . . is actively co-operating with the Research Committee of the American Electroplaters' Society in laying the groundwork for the preparation of specifications for certain plated coatings on iron and steel which are of considerable public interest. It is anticipated that before specifications can be written, considerable development work must be done on methods of testing, plated coatings, evaluating the various types of coatings for particular exposures, and selecting plating solutions and methods best suited to produce coatings of known characteristics.

"Sub-Committee VII has been mostly concerned in determining the demand for new investigations and methods of testing. The Research Committee is still considering the possibility of developing a laboratory test which will predict service in the atmosphere. Its work is still confined to the simulated industrial atmospheric test, although the influence of salt spray is also under consideration. . . . The progress to date has not been encouraging, although a large amount of work has been accomplished. The difficulty . . . involves the great variation in corrosion rate encountered in actual atmospheric exposure tests at different locations. It may be necessary to develop apparatus of a more flexible nature in which it will be possible to so vary the influence of a number of corroding agents as to duplicate a particular atmospheric condition."

We are faced with the fact that the salt spray test is trustworthy only for zinc coating, and the Preece test is limited in scope and difficult to interpret. As a result, the only tests which can be relied upon are actual service exposures which take years to complete. This is obviously, an unsatisfactory condition.

All of which leads directly to the conclusion that one of the primary needs of the industries devoted to the manufacture of alloys and the coating of metals is the perfection of trustworthy, accelerated corrosion testing methods.

Honest Technical Control

THE electroplating industry, in its most progressive elements, is now fully awake to the need for the technical control, by analysis of electroplating solutions. These progressives were of course, the first to develop and install such methods. Within recent years, however, the industry as a whole has awakened to the advantages of control, and the elimination of excessive errors thereby. As a result, there has been a demand for such information from the small as well as the large shops. All of this has been most encouraging and directly in line with progress.

But there have been—as there always are—unpleasant accompaniments. With the demand for knowledge of plating solution analysis, quicker methods, less expensive to operate and easier to learn, has come a type of consultant whose work, while seemingly technical in character, has been, in actuality, unsound and detrimental to the industry as a whole. These consultants have offered and installed methods of testing and analyses which have, as their talking point, largely one property—speed. When questioned about the accuracy of these methods, their proponents claim that they are "good enough for practical purposes."

What are the facts? There are rapid methods of analyses which are slightly less accurate than the fine, detailed, hair-trigger work possible in the analytical laboratory. These rapid methods, however, have definite limits. If they overstep these limits, if the operations are over-simplified, they lose so much of their accuracy as to become valueless.

Good, trustworthy methods of analysis have been published many times by the American Electroplaters' Society, in "The Monthly Review" and special Branch pamphlets; also in the METAL INDUSTRY and its allied publication, the PLATERS' GUIDEBOOK. These methods are tested, tried and known to be correct. There may be and undoubtedly are others. But beware of the over-simplified, too rapid short cuts. Beware of the words "good enough"—and beware of the man who sells on that basis. Be sure of his standing and reputation before accepting his advice.

The Platers' Convention

THE 20th Annual Convention of the American Electroplaters' Society will be held in Philadelphia, June 20-23. Details are given in full in the leading article in this issue. The Society is using excellent judgment in trimming its costs in accordance with the times. It is using even better judgment, however, in refusing to trim the quality of its program, which is as high as ever in its technical and educational features.

The entertainment will be excellent, between the Annual Banquet of the A. E. S. and the Open House Night of the International Fellowship Club.

We echo the words of "The Monthly Review" of the A. E. S. when we say that every plater who can attend these meetings owes it to himself to be present. Owners and managers of plants which include metal finishing departments should spend a few days themselves in attending these sessions and also make it possible for their foremen platers to go.

Be sure to attend the Electroplafers' Convention!

Correspondence and Discussion

Metal Industry Invites Correspondence on Subjects of Interest to Its Readers.

Carbonyl Compounds for Plating

Editor, METAL INDUSTRY:

In your May issue, page 191, there appeared a request for information relating to the use of carbonyl compounds of certain metals in electroplating. The writer in 1929 had attempted to use gold carbonyl chloride in some research investigations in the electroplating of the noble metal. These experiments were later abandoned, due to several causes such as insolubility and its decomposition being easily effected by certain compounds and heat. Later, attempts were made to use other carbonyl compounds, including nickel and copper carbonyl. These experiments were also abandoned for the same reasons. Some of the compounds decomposed in water.

Though carbonyl compounds are very useful in the recovery of the metals from ores and sludges, the writer does not believe they will enter the electroplating field.

Carbonyl compounds can easily be prepared in several ways. A few methods are:

1. Treating a solution of the metal with carbon monoxide and condensing the vapors in a suitable chamber or vessel.

2. Heating the metal powder to a certain temperature, depending upon the metal, and quenching while hot into liquid carbon monoxide, then allowing the gas to liberate by raising the temperature above its freezing point.

3. Passing the gas over heated metal powder, the temperature varying with the metals used, and collecting the product in a suitable chamber or vessel.

ALTON PETROSKI.

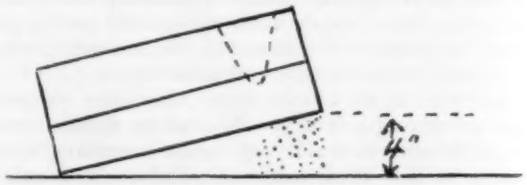
Irvington, New Jersey

Casting Aluminum Plates

Editor, METAL INDUSTRY:

In regard to Mr. Reardon's answer to Problem No. 5,084 on "Casting Aluminum Plates":

The advice is very good; but if he advised that the caster elevate



the mold as indicated in the accompanying sketch, the casting would fill. He should pour on the hot, or about 1700°.

WILLIAMS FOUNDRY.

Detroit, Michigan

New Books

Bibliography of Bibliographies on Chemistry and Chemical Technology. Two supplements for 1929 and 1931. Compiled by C. J. West and D. D. Berolzheimer for the Research Information Service of the National Research Council, Washington, D. C. Size 6½ x 9½; 150 pages, paper bound. Price $1.50.

This is bulletin No. 86 of the National Research Council, continuing the work of gathering the various bibliographies in different fields of chemistry. New supplements will be continued to be issued from time to time.

The Effect of the Products of Combustion on the Shrinkage of Metal in the Brass Industry. By C. Upthegrove and A. J. Herzig. Published by the Department of Engineering Research, University of Michigan, Ann Arbor, Mich. Size 6 x 9; 66 pages, paper bound. Price $1.00.

The investigation reported in this bulletin covers studies made of the effect of the products of combustion and of fluxes on the shrinkage of metal in the melting of simple and complex brasses. The conditions of furnace atmosphere and temperatures and the composition of the metal were found to be the factors largely controlling the shrinkage.

Shrinkage in the melting operation occurs either by volatilization or by oxidation of the alloying constituents. In the first case, the loss is through the stack, while in the second, it is represented as dross or skimmings. Whether or not the loss is primarily by volatilization or by oxidation will be determined by the composition of the metal and by the nature of the furnace atmospheres. In the melting of metals in which volatilization losses predominate, a slightly oxidizing atmosphere may be used to provide protective crusts which will result in a lowering of the metal shrinkage. In the melting of metals in which the oxidizing losses predominate, the neutral or reducing atmospheres may be used to bring about the minimum shrinkage.

The use of fluxes as a means of lowering the metal shrinkage must be based on the same considerations as hold for the lowering of metal shrinkage by furnace-atmosphere control. A flux showing very satisfactory results in producing a lowering of the metal shrinkage is developed.

The Effect of Temperature on the Properties of Metals. A Symposium. Published by the American Society for Testing Materials. Size 6 x 9; 829 pages. Price $6.00.

This book is a compilation of a symposium held jointly by the A. S. T. M. and the A. S. M. E., on the effect of temperature on the properties of metals held in Chicago, June 1931. The contributors are all experts qualified to appraise and interpret the data of others as well as their own.

The book is divided into two general sections: one dealing with engineering trends and requirements for metals at high and low temperatures; the other with the properties of available metals for high and low temperature service. The requirements are given of the power plant industry, steam turbines, steam piping, the oil industry, the chemical industries, the ferrous metal industry, the non-ferrous roasting, smelting and refining industry, the automotive industry and ceramics. A review is included, of the progress in Great Britain on the engineering uses of metals at elevated temperatures. The properties under high and low temperature service are described for zinc alloys, aluminum and magnesium alloys, bearing metals, copper and its alloys, iron, chromium, nickel alloys, rare metals, etc.

To supplement the volume described above there are available two bibliographies on the effect of temperature on the properties of metals, including a short bibliography on the oxidation of metals at high temperatures. This is published in two sections, from 1828 to 1928 and from 1928 to 1930, at a price of 75 cents each or $1.35 for the combination.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Alloying and Casting

Q.—Kindly give us the best method of alloying and casting zinc base alloy analyzing 91 zinc, 9 aluminum, 2 copper, 1 tin. Our big difficulty seems to be in getting a homogeneous mixture of the ingredients because of some segregation.

A.—This alloy is similar to the bearing metal called "Sampson Metal," which runs 88 zinc, 8 aluminum, 4 copper. And to alloy this so it will be free from segregation, we suggest the following:

Use high grade zinc, 99% plus, and make a hardener consisting of 20% copper, 10% tin, 1% of 30% manganese-copper, 69% aluminum. This is a deoxidizer.

Charge the copper and manganese-copper. As soon as it gets soft add 50% of the aluminum. When melted add the balance. Stir well and pour in ingot. Then melt the zinc in an iron kettle as follows: charge 88.75% zinc, and when melted add 1.25% aluminum; then add 10% hardener. Stir well and flux with salamoniac and chloride of zinc. Keep metal at a white color when pouring. Do not make the ingots too big; not over ten pounds. Remelt for casting.

Your mixture reads 103%. We figure it at 100%.

This mixture has been used for motor bearings and it said to be quite satisfactory. If you follow the above and do not overheat the alloy you will secure the results you desire. However we again suggest that you use only high grade zinc of low lead content.

W. J. R., Problem 5,098.

Cleaning Silverware

Q.—What would you advise for cleaning silverware cheaply and quickly for commercial use. Silverware that has tarnished, but has a fairly good silver surface.

A.—If the tarnish is very heavy, we suggest the use of an electric cleaner and a hot cyanide solution to remove it. This will discolor the surface, so that it will be necessary to recolor or scratchbrush to obtain the original finish.

Another method that is used to remove the tarnish, if it is not too great, is to place the work in an aluminum pan which contains a solution of carbonate of soda, 4 to 6 ozs., to a gallon of water and used hot.

Another method is to place the work into a solution of hyposulphite of soda 1½ to 2 lbs. per gallon of water.

O. J. S., Problem 5,099.

Coinage Bronze

Q.—We are asked to furnish a bronze memorial tablet the specifications of which call for the mixture to be "government bronze," having a dark coinage color in the casting itself, and not obtained by plating or chemical treatment. We are now coloring the backgrounds of our tablets with chemicals applied under certain temperature. In this case, however, that will not be permissible, and if you can tell us what the architect means by dark coinage color and how it can be produced, please do so.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all blanks if possible.

Date .....

Name and address:.....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.: .....**Cathode surface, sq. ft.:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

A.—If it is not permissible to finish the bronze tablet by using chemicals, it would seem you will have to secure this color by your mixture. The mixture must be determined for the color desired, and only pure metal used. The alloy we would suggest trying would be 3% zinc, 6% tin, 1½% lead, ½% of 30% manganese copper, and 89% copper.

The colors of alloys quickly change by variations in their composition. The mixture given above will acquire a beautiful patina in time. This color is much desired in statuary bronze.

Sexton gives the following mixture for coinage bronze:

British bronze coins..... 95 copper, 4 tin, 1 zinc.
French coins ..... 95 copper, 4 tin, 1 zinc.

It may be one of these mixtures is what you require, and we suggest a sample be submitted for approval before casting.

W. J. R., Problem 5,060.

Darkening Silver

Q.—We would appreciate your sending us a process for darkening silver similar to blueing steel. The more simple the process and the harder to remove the dark finish the better it will suit our purpose.

A.—Silver or silver plated work is blackened by dipping into a sulphur solution. A solution of potassium sulphide and water is used for this purpose. Use 1 oz. potassium sulphide dissolved in 1 gallon water, and heat to boiling temperature.

The work should be clean and free from finger marks, and a light scratchbrush operation produces an even black color. It may be necessary to repeat the dipping and scratchbrush operations to produce satisfactory color.

O. J. S., Problem 5,061.

Iron Plate on Copper

Q.—I have a copper wire travelling at a high speed. I want to electroplate this copper wire with a thin and homogeneous film of iron. Will you please tell me the solution you think will answer the purpose, and the current density used in this solution?

A.—We would suggest that you use the following formula for the iron solution:

Ferrous chloride	40 oz.
Calcium chloride	45 oz.
Water	1 gallon.

Use at a temperature of 200° F., and a current density 60 to 80 amperes per square foot. The amperage will depend upon the speed at which the cathode travels through the solution.

O. J. S., Problem 5,062.

Nickel Plating

Q.—I am having difficulty in keeping the pH concentration of my nickel plating solution down to approximately 6.0. About 300 pounds of small pencil ferrules will raise the pH .3 to .4.

This material, after burnishing, is dipped into a proprietary metal cleaner, and rinsed in running water for about ten minutes. The elimination of this dip gives a dark brown deposit, but with the dip the plating is good.

Can you suggest a treatment after burnishing in soapy water of material which will not tend to make plating solution alkaline?

A.—We believe that your use of the soap chips for the burnishing medium is correct. After the work is burnished, it is necessary to use an alkaline cleaning solution such as you are using to remove the film of soap from the work before nickel plating. It is also necessary to remove or neutralize the alkaline film that is left on the work from the cleaning solution before placing the work in the nickel solution. If this is not done, the pH of the solution will increase.

We would suggest that after the cleaning operation the work be rinsed in clean cold water, then dipped in a muriatic acid pickle to remove the cleaning solution, then rinsed thoroughly in clean cold water and nickel plated.

The muriatic acid pickle is made of muriatic acid 1 part, water 3 parts.

O. J. S., Problem 5,063.

Plating Steel Mirrors

Q.—We are enclosing sample steel mirror used in vanity cases, on which we encounter some difficulty. We want to call to your attention the pitted effect which appears in the surface of these mirrors when plated.

Would it be possible for you to furnish us with any information as to the possible cause of this condition?

A.—The pitted effect of the nickel deposit is due to hydrogen gas deposited with the nickel. This effect will appear in the deposit where the pH of the solution is either too low or too high. The pH should be adjusted to 5.8 to 6, and if this does not overcome the trouble add peroxide of hydrogen to the solution until the pitting stops.

The quantity of the hydrogen peroxide to use will vary somewhat with the condition of the solution, but usually 1 quart of 25 volume hydrogen peroxide to each 100 gallons of solution will produce results.

O. J. S., Problem 5,064.

Silver and Nickel Analyses

Q.—We are sending under separate cover samples of our silver and nickel solutions. We would appreciate your analysis and advice.

We plate on regular antimonial lead composition. To silver solution No. 1 we have just added 100 ounces of fine silver that we cut down to chloride. This tank holds 95 gallons. It worked fine for about half a day. We then found the same old symptoms that looked as if there might be a lack of metal in the bath. We feel sure we have not plated enough in that half day to go through 100 ounces of silver. Is it possible that our plater, who is a new man, did not fully dissolve the chloride and that it is on the bottom of the tank? You will no doubt be able to tell from the sample. Our anodes are being used up twice as fast as normal and remain bright while plating, which leads us to believe that there is enough cyanide in the solution. We do quite a bit of plating every day. We wonder if you could advise us how we might judge when to add metal to the solution?

The nickel solution has been fixed according to your advice and still does not work.

A.—Analysis of silver solutions:

No. 1	Metallic silver	2.55 oz.
	Free cyanide	8.90 oz.
No. 2	Metallic silver	1.27 oz.
	Free cyanide	5.94 oz.

No. 1 silver solution is high in cyanide, and this is the cause of the anodes dissolving so rapidly. The amount of free cyanide would dissolve all of the silver chloride that was added, so none remains on the bottom of the tank. Would suggest that you operate the solution at a low current density; and do not add any more cyanide to the solution for some time.

To No. 2 solution we suggest that you add 2 ounces of silver cyanide to each gallon.

Analysis of nickel solution:

Metallic nickel	3.76 oz.
Chlorides	3.19 oz.
pH	6.2

The constituents of this solution have changed considerably since analysis was made on December 12, 1931. The chloride content has increased and so has the pH. The pH is too high. We suggest that you add 5 fluid ounces of c.p. sulfuric acid to each 100 gallons of solution.

O. J. S., Problem 5,065.

Melting Flux

Q.—Can you tell us the proper flux to use in melting an alloy containing manganese? There is also copper, silver and nickel in the alloy. We have been unable to find the right flux to produce a satisfactory melt.

A.—A flux that is said to give good results contains calcium and copper. Such flux is sold under different numbers by a number of firms whose names are being sent you under separate cover by mail.

W. J. R., 5,066.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,845,016. February 16, 1932. **Method of Ornamenting Metal Surfaces.** Umberto D'Atri, Canton, Ohio, assignor to The United Metal Products Company, Canton, Ohio.

The method of decorating metal surfaces which consists in placing a mask, having openings therein, upon a polished metal surface to be decorated, applying a liquid coating which hardens upon drying and containing bakelite upon the portions of the metal surface exposed through the openings in the mask, removing the mask, drying the coating, subjecting the surface to the action of a fiber brush, and the removing the coating from the surface.

1,845,052. February 16, 1932. **Apparatus and Process for Making Metal Patterns.** Arthur K. Laukel, Detroit, Mich.

A process for producing patterns by electrodeposition and an electrolytic apparatus.

1,845,103. February 16, 1932. **Alloy.** William A. Schubert, Troy, N. Y., assignor of one-half to Herman A. Schubert, Troy, N. Y.

An alloy containing from 35% to 75% of tin, from 20% to 60% of zinc, from 1% to 4% of antimony, from 1% to 4% of lead, and from 0.5% to 4 of aluminum.

1,845,155. February 16, 1932. **Process for Raising the Resistance of Zinc to Tearing During Rolling.** Franz Jordan, Wickede-Ruhr, Germany.

A process for raising the resistance of zinc to tearing during rolling consisting in applying thin aluminum strips by pressure to a comparatively thick core of zinc so that the aluminium strips completely cover the core on two opposite surfaces while the thickness thereof amounts to 5-10% of that of the core, subjecting these parts to a preliminary rolling process so as to effect a union thereof, and finally rolling out this combined material into thin strips at high rolling pressures without intermediate heating so as to prevent cracking of the zinc core.

1,845,228. February 16, 1932. **Process and Apparatus for Melting Down Easily Fusible Alloys.** Karl Brackelsberg, deceased, Schwelm, Germany, by Auguste Brackelsberg, administrator, Milspe, Germany.

Process for melting down easily fusible and easily oxidizable metals characterized by the employment of a rotary furnace in such manner that the furnace is first internally heated by means of a flame without the charge, the heating is then shut off, the charge is introduced into the furnace and the furnace is rotated, the charge being melted down solely by contact with the highly heated, rotating walls and external air being excluded.

1,845,231. February 16, 1932. **Method of Ascertaining the Amount of Coating on Materials.** Bertie Lee Browning, Philadelphia, Pa., assignor to Leeds & Northrup Company, Philadelphia, Pa.

The method of determining the time for removal of a coated body from an electrolyte, the materials of said body and of its coating having substantially different electrical conductivities, which comprises passing an electric current through a path including said coated body and the electrolyte, measuring the magnitude of said current, and noting the time of occurrence of a substantial change in the rate of change of said current.

1,845,694. February 16, 1932. **Treatment of Alloys.** Robert T. Wood, Lakewood, Ohio, assignor to Aluminum Company of America, Pittsburgh, Pa.

The method of improving easily oxidizable metals, comprising treating the molten metal by passing therethrough helium gas.

1,845,781. February 16, 1932. **Controlling Grain Growth in Aluminum-Manganese Alloys.** Theodore W. Bossert, New Kensington, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

An aluminum-manganese alloy containing about 0.75 to 3.0 per cent of manganese and about 0.2 to 0.7 per cent of uranium.

1,845,978. February 16, 1932. **Process for the Electrolytic Production of a Particularly Strong Chromium Coating.** Martin Hosenfeld, Berlin-Siemensstadt, Germany, assignor to Metal & Thermit Corporation, New York, N. Y.

In a process for the production of a particularly strong chromium coating, the combination of first producing a chromium coating by aqueous electrolysis on the object to be coated, and then depositing chromium upon said coating by electrolysis of a chromium containing molten bath.

1,846,053. February 23, 1932. **Article Handling Machine.** Albert H. Hannon, Detroit, Mich., assignor to Frederic B. Stevens, Inc., Detroit, Mich.

In machines including a plurality of tanks in which articles are transferred from one tank to the next, transfer means comprising a vertically arranged chain conveyor and sprocket wheels therefor, a work lifter on said chain comprising an elongated lever member pivoted on said chain at its fulcrum, a fork on the upper end of said lever adapted to engage the work, a guide block on the lower end of said lever, and a vertical guide for said block in alignment with the axes of said sprockets.

1,846,558. February 23, 1932. **Process for Making Self Improving Aluminum Alloys.** Siegfried Junghans, Villingen/Schwarzwald, Germany.

An aluminum alloy having Brinell hardness of about 170 and a specific gravity of about 3.15, consisting of the following ingredients in approximate weight proportions; chromium 2%, tungsten 1%, copper 15%, nickel 0.5%, magnesium 0.5%, manganese 2% and the remainder aluminum.

1,846,697. February 23, 1932. **Method of Making Brittle Cathodes.** Harry H. Stout, Jr., New York, and William H. Osborn, Garrison, N. Y., assignors to Copper Deoxidation Corporation, New York, N. Y.

The process of electrolytic deposition of copper which includes coating a blank with a film of asphalt, inserting the blank in a bath of electrolyte and passing an electric current through the electrolyte between the blank and an anode, the asphalt film being of such thickness and properties that copper is deposited against it from the electrolyte is brittle.

1,846,844. February 23, 1932. **Process of Treating Aluminum.** Frank M. Clark, Pittsfield, Mass., assignor to General Electric Company, a Corporation of New York.

The process of forming an electrical insulating coating on aluminum which consists in bringing the same without the application of externally applied electrical energy into contact with an aqueous solution of a silicate of an alkali metal, said silicate being associated with hydroxide of alkali metal in sufficient quantity to produce by chemical action a dielectric coating on said aluminum.

1,846,869. February 23, 1932. **Pyroxylin Enamel.** Frank C. Hoffman, South Amboy, N. J., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del.

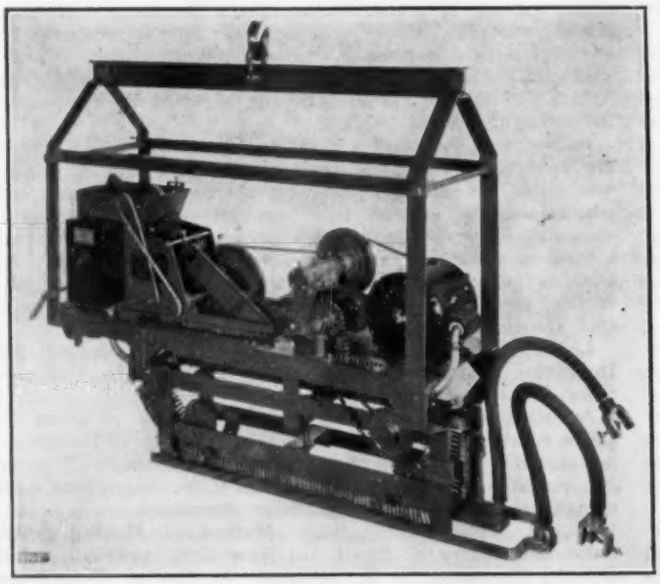
The method of producing a coating composition that will produce a crackle finish comprising adding to a completed cellulose nitrate coating composition a second composition comprising finely divided soap suspended in a cellulose nitrate solvent from the group consisting of aliphatic alcohols and esters, the second composition being added in such amount that the soap in the final composition is between 10% to 15% by weight of the first composition.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Automatic Chromium Plating Machine for Small Work

Sturt Engineering Corporation, 7001 North Clark Street, Chicago, Ill., has placed on the market the "C P" automatic chromium plating machine for putting this type of electroplate on such work as bolts, screws, rivets, escutcheon pins, etc. It is claimed the machine performs such work in a highly efficient, economical manner. Cost is said to be reduced to a fraction of the cost of still plating such small work.



New Device by Sturt Engineering Corporation for Automatic Chromium Plating. This Machine Is Placed Over a Tank of Solution.

Briefly, the operation of the Sturt equipment is as follows: The work is dumped in bulk into a feed hopper, is delivered to an inclined slide "heads up," then by gravity it goes to a feed mechanism which places each piece in a holder. The holders are mounted on an endless chain which carries the holder and work into the plating solution. While in the solution the work is "heads down" and fully immersed. When it has passed through the bath it is plated, and it is then released by the holders into a chute which conveys them to any receptacle used for rinsing and drying. There are 180 holders on the conveyor, and operation is continuous.

The illustration here shows the complete mechanism, without the tank. The machine requires clear tank space 48 in. long, 9 in. wide, 9 in. deep. It is removable from tank, permitting use of latter for other work. The mechanism is 60 in. long, 15 in. wide and 48 in. high. It weighs less than 500 lbs. The maker states that every effort has been made to provide a substantial machine which is simple to operate, and it has been so designed that the operator needs very little training. It is run by a ½ H. P. motor, with manual motor starter switch and clutch control for feed hopper.

The Sturt company states that all details have been carefully considered, in order to provide a high standard of efficiency and economy of operation. Such parts as feed hopper mechanism, conveyor frame, synchronization of feed and conveyor, chain and holder construction and numerous other things have all received careful study. It is also pointed out that "drag out" of solution has been considered and a small blower has been provided to remove as much of the chromium solution as possible before the first rinse. Attention has also been given to insulation of parts to prevent excessive "plating out" of solution on parts of the machine itself. Another detail fully covered, it is stated, is the matter of good electrical contact with the work.

A circular giving complete data is available to readers from the manufacturer.

Rubber-Lined Exhausters for Chemical Fumes

Buffalo Forge Company, Buffalo, N. Y., announces a line of fume exhaust apparatus for chemical service. This consists of rubber-lined exhausters with rubber-covered fans, designed to withstand the corrosive action of various acid and other fumes. Among the features claimed are complete removal of fumes economically and continuous operation without breakdown losses. The maker states that the rubber linings and coverings are applied by the Goodrich "Vulcalock" process, which insures perfect and permanent adhesion as well as great strength of the bond between the rubber and steel. Pure, soft rubber is used, and it is claimed this will not harden or otherwise lose its life. A single, continuous lining is used, and fumes are effectively kept from coming in contact with any metal.

The equipment is stated to be applicable to many fume exhaust requirements, including removal of fumes from all types of baths used in metal finishing, plating, treating, pickling, etc. Full data are available to readers upon application to Dept. BF-2, Buffalo Forge Company, Buffalo, N. Y.

Udylite Cleaner Test Set

Udylite Process Company, Detroit, Mich., has developed a testing set for determining the strength of "Udylite" cleaning solutions used in plating plants. The company, which licenses platers to use the "Udylite" cadmium plating process, states that the set enables the plater to make an accurate test of the efficiency of the cleaner. It is stated that since the concentration of emulsifying agents in the "Udylite"

Test Set for Udylite Cleaner

cleaning solution are generally stable, a test of its alkalinity is an index of its strength. The test set measures its alkalinity. It consists of a quart bottle of weakly acid solution, a special indicator, a pipette with rubber bulb inserted in a stopper for the test solution bottle, and a 6 ounce bottle for testing. These are enclosed in a wooden case. An instruction card is furnished. By a simple procedure the plater without chemical training is able with this apparatus to test the "Udylite" cleaning solution, the makers state.

Readers can obtain full information on application to Udylite Process Company, at Detroit, or any of its branches.

Eye and Throat Protection

Chicago Eye Shield Company, 2300 Warren Boulevard, Chicago, Ill., offers a complete line of equipment for the protection of platers and other plant workers

from fumes, dust, flying particles, etc. The company has a special type of respirator for protection from chromium fumes and other especially dangerous acid fumes. The company makes goggles, masks, respirators and helmets of all kinds.

Aluminum Cleaner

E. F. Houghton and Company, Philadelphia, Pa., offers a series of cleaning preparations for use on aluminum and aluminum alloy products. The materials are known as "Houghto-Clean" and are designated by numbers according to the various types of application for which they are designed, such as cleaning after polishing or buffing; removal of baked-on oils or fats; cleaning of aluminum parts of various types of food handling equipment; removal of oils used in fabrication of aluminum; cleaning old automobile parts; cleaning duralumin prior to anodic treatment. The company states it has especially developed the materials through considerable research. Complete information is available to readers on application to the Houghton Company.

Porcelain Enamelers' Course

Ferro Enamel Corporation, Cleveland, O., announces a training course for porcelain enamelers, to be held in Cleveland the week of June 20. The class will be under the direction of J. E. Hansen, Research Engineer for Ferro, whose, new volume, "The Advanced Technique of Porcelain Enameling," will be used as a text.

Headquarters for the school will be at Ferro's offices, 2100 B. F. Keith Building, Cleveland, O.

Flexible Aluminum and Black Lacquers

Roxalin Flexible Lacquer Company, 35-40 Thirty-sixth Street, Long Island City, N. Y., offers several new products for metal finishing. These include a series of black finishes known as "Blue Knight Blax" for one-coat applications on clean metal; and "Blue Knight Leaflex" for all aluminum powder finishes.

The "Blax" finishes are produced in a variety of types for various applications, such as spraying on clean metal—cold rolled steel, brass, aluminum, etc. Three grades are available: SF for flat sheen, gray black tone; SR for semi-gloss, rubber finish; SG for gloss black, jet black. The manufacturer makes the following claims for the material and offers samples of coated metal to substantiate them:

No primer is required; air-drying in regular lacquer time eliminates baking; no blushing at relatively high humidities; two-year tests for permanence showed no loss of adhesion or flexibility; high resistance to chipping flaking, etc.

The "leaflex" aluminum powder finish is stated to provide a cost-saving aluminum coating having great strength and flexibility, and fine appearance. The maker states the material effects a saving of 25% in aluminum powder consumption, a greater area being covered by flat-lying metal particles; the "shingled" effect is cemented by proper lacquer into an almost continuous film; its unity provides great strength and flexibility; it will withstand rigid testing, such as bends over ½ in. pipe, embossing, etc.

"Leaflex" is offered in several grades: Medium 5900 for air-drying finish on brass, aluminum, steel, die-castings, wood and various compositions; Heatproof Medium for surfaces to withstand high temperatures, this grade being made to air-dry overnight or bake two hours at 200°F.; will not blister or discolor at temperatures up to 600°F. Perspiration-proof Medium for telephone instruments and similar work. Special grades for textile and paper work. Also, the company has developed "Leaflex" thinner and "Leaflex" aluminum, a powder for use in finishing.

Another Roxalin product is "Flexible Clear 4917." This lacquer was developed to withstand very severe outdoor exposure. The maker states that tests at Miami, Fla., subjecting the material to strong sunlight, and salt and highly humid atmosphere showed it to have practically perfect flexibility, adhesion and color after two months of continuous exposure. The material is suitable for coating brass, bronze, cadmium plate and other metal surfaces.

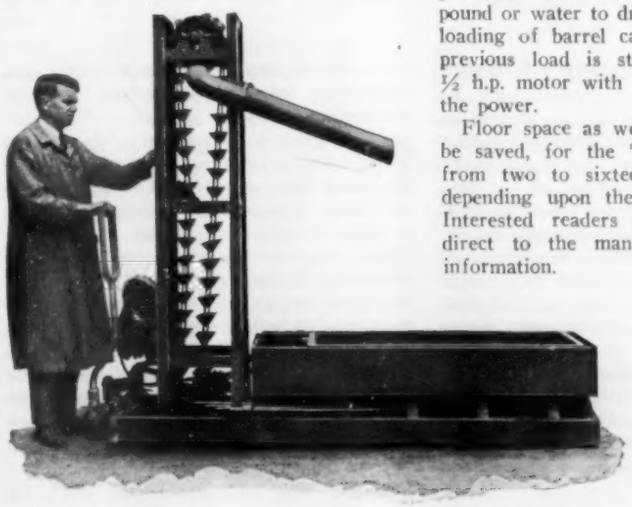
Burnishing Barrel Loader

The "Abbott Ball Speed-Loader," a new motor driven time-saver for burnishing barrel operation, designed by W. R. Hartley, Materials Handling Engineer, New Haven, Conn., is now being manufactured and sold under license in the barrel burnishing field by The Abbott Ball Company, Hartford, Conn.

Used in conjunction with a battery oi barrels, this portable, apparatus eliminates hand shoveling in loading and unloading burnishing barrels, making for considerable time saving. As the equipment was designed for a burnishing installation, it has been possible to include refinements and details that will appeal particularly to those who demand utmost efficiency it is stated. Special emphasis is placed on structural strength and combination of welded and bolted construction to withstand long, hard service and abuse.

The "Speed-Loader" is an L-shaped unit consisting of steel tower and base mounted on three 5" casters equipped with roller bearings. It is rolled into position so that the base extends under the burnishing barrel, the contents of which are emptied into a separating tray that sets in a hopper mounted on the base. The upper side edges of this screen-bottomed tray are flanged to rest on steel rollers mounted on the hopper. This permits easy riddling that retains the burnished articles in the tray while the burnishing materials drop through to the hopper from which they can be returned to the barrel without removing the tray. This storage hopper is provided with a screen allowing all compound or water to drain off the balls. Reloading of barrel can be started while a previous load is still being riddled. A ½ h.p. motor with speed reducer supplies the power.

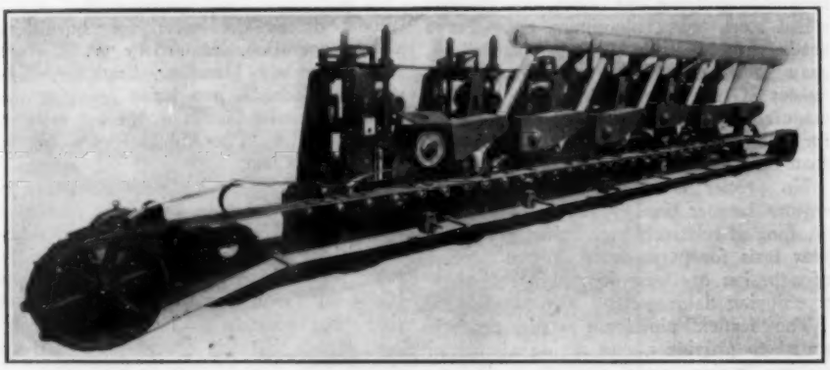
Floor space as well as time are said to be saved, for the "Speed-Loader" serves from two to sixteen burnishing barrels, depending upon the nature of the work. Interested readers are invited to write direct to the manufacturer for further information.



New Machine for Loading Burnishing Barrels

Straight-Line Automatic Polisher and Grinder for Automobile Bumpers

Excelsior Tool and Machine Company, East St. Louis, Ill., has developed an automatic, straight-line grinding and polishing machine for automobile bumpers of modern design. The equipment, known as No. 29, is stated to be capable of turning out up to 2,000 bumper bars a day. It is designed for the type of bumper in greatest use today, which has a wide oval or corrugated face, high curves, etc. The machine provides for the greater lift and space between conveyor belt and polishing wheels necessitated by the increased curves of the bumpers. It also provides for minimizing the wheel friction on the precipitous ascent of the wheel as it travels over the work.



New Automatic Grinder and Polisher by Excelsior

The No. 29 machine has a 12 inch wheel rise, with polishing heads spaced to accommodate the work. It is stated to be of heavy construction. It has a dust suction system of high capacity. Each unit is equipped with 10 H. P. motor, connected to spindle by grooved pulleys and six V belts. Other features are counterweights to prevent wheels from bouncing on curves; double dust spouts; ball bearings on all equalizing connections; Reeves adjustable speed regulator for driving belt conveyor.

The No. 29 machine is available in units having from 2 to 14 wheels. The 14 wheel machine turns out from 1,000 to 2,000 bumper bars per day, depending upon size and shape of work. A 6 wheel machine requires floor space 6 by 48 feet, and weighs about 25,000 pounds.

Excelsior Tool and Machine Company has had long experience in building equipment of this kind. The firm has been in business 35 years. In 1924 it designed and built the first straight-line automatic polisher for flat irons, for Westinghouse, it is stated. The equipment was generally adopted by the industry. In 1926 the company built an automatic bumper grinder and polisher for Ford Motor Company, which also had great success, it is stated, and the No. 29 machine described above is a modernization and improvement of the finishing equipment.

Eliminating Slippery Floors

Moving more or less continually to and fro, the feet of machine operators wear the floor smooth. Dripped, spilled and flying oil in very small amounts imparts to that smooth floor a slipperiness which constitutes a real hazard. Many men have been injured as a result. Approaching this problem, the minds of executives and maintenance men quite naturally turn to abrasives as a logical application to eliminate the trouble. Some firms apply a coating of glue and sand, or a coating of waterglass and abrasive dust from grinders. Wearing away of the abrasive is the only fault of such applications, and it is necessary to renew them from time to time. Labor costs on repeated applications may run high, regardless of the low cost of the materials.

Some firms have turned to the use of a special type of floor plates, made of a so-called abrasive metal. Embedded into the surface of the metal, the abrasive cannot wear away. Applying these plates to floors at machine locations and finding them everything that could be desired, some have extended their use to other places also, notably stairs and elevator thresholds, where slip-proof surfaces are especially desirable. Abrasive metal plates are made for this purpose by American Abrasive Metals Company, 50 Church street, New York City.

Stibloy Corrosion-Resisting Metal Compound

The Stibloy Products Company, Inc., Koppers Building, Pittsburgh, Pa., has taken over the assets of the Liquid Metal Products, Inc., Chicago, Ill., producers and distributors, under the Arent patents, of "Stibloy," a metal compound in liquid form, which acts as a primary coating to hold paint, enamel and lacquer, permitting immediate finishing of newly galvanized metal surfaces.

"Stibloy" was developed to extend the life of galvanized surfaces by protecting them from the effects of atmospheric conditions and from the damage caused by exposure to gases, acid fumes, smoke and brine. It is used for protecting and preserving galvanized roofing, siding, sheeting, guttering, downspouts, wire fencing, air ducts, car roofing, screens, nails, transmission towers and other galvanized products, as a primer, not a paint. "Stibloy" applied to poster panels and paint bulletins guarantees permanent adhesion for paint, lacquer and paper on the fronts of signs, and retards corrosion on the backs, it is stated.

Officers of the Stibloy Products Company, Inc., control of which has been acquired by the Kopper Products Company, are: president, J. N. Forker; vice-president, S. H. Bell; secretary, John D. Shaner; and Treasurer, S. T. Brown. "Stibloy" will be manufactured in the various plants of the Koppers Products Company, and full information is available to readers at all district offices of the Koppers company.

Pneumatic Acid Pump

Frederic B. Stevens, Inc., Detroit, Mich., offers the Thompson pneumatic pumps for drawing acids and other liquids from carboys or barrels. The device is stated to prevent accidents in handling dangerous chemicals, including elimination of fume hazard. It is stated to be easy to operate, providing a smooth and rapid flow of liquid. The Stevens company stresses the fact that the pump is in use in many large chemical using plants, including plating and die casting shops. Low price is also said to be a feature.

Thompson Pneumatic Pump for Carboys and Barrels

Readers desiring more complete data should apply to the Stevens company or any of its branches.

Grinding and Polishing Machine

A machine for the grinding and polishing sheet metal, especially stainless steel, has been designed and built by The Schulte Grinding and Polishing Machine Company, 6400 Breakwater Avenue, N. W., Cleveland, Ohio. The new feature of this device is three-center grinding, which is accomplished by two collapsible rollers which regulate the pressure below the grinding wheel or grinding belt.

A half-inch interwoven endless belt, 50 in. wide, transports the sheets or cut strips

Schulte Sheet Finisher

over two backing-up rollers and below the grinding wheel, by which an inner semicircle is produced which allows a quick and rough grinding without burning the sheets or strips.

The machine is also equipped with reversible control for the belt drive and an oscillating movement for the grinding wheel, including a two-way limit switch which makes the machine travel in two directions at a given length, according to the length of the sheet, continuously until stopped by a push-button.

The machine is supplied with wheel or belt equipment, or both. The belts are easily adjusted and removed. The machine is also very productive for buffing all kinds of wide sheet metal, it is stated. The machine is also supplied with pinch rollers for continuous grinding. This is done by placing a truck with sheets in front of the machine and another empty truck behind the machine, whereby one man can feed the large size sheets through the machine without the danger of kinking or buckling wide thin sheets.

Remelt Aluminum Made by New Deoxidizing Method

A new type of remelt aluminum is said to be provided by a process developed by R. Lavin and Sons, 3426 South Kedzie Avenue, Chicago, Ill., ingot producers. According to this firm, the method involved considerable research with a view to producing ingots of aluminum containing a minimum of oxides or free alumina. These impurities are said to increase in aluminum each time it is remelted unless some means of eliminating them is employed. Considerable work has been done in the past on this matter of cleaning the metal when remelting scrap to produce ingots, but the Lavin company found that until it devised a completely new method of remelting as well as fluxing, the ingots continued to give trouble due to impurities. First principle of the Lavin method is the choice of scrap to eliminate all but the best cast or sheet material. It was also found necessary to develop a melting process, and experiments were made with various types of furnaces. Multiple-chamber furnaces were finally chosen in which the air for combustion is preheated. A combination of chemicals which generate an efficient dry gas for deoxidizing and removing alumina was also developed. After further experimentation with the process it was adopted for regular production.

The Lavin company states that its No. 12 aluminum ingots thus produced have been tried in numerous foundries, die casting plants, permanent mold shops, etc., with universally satisfactory results in a very great variety of work. They state the metal has all the properties aluminum should have, including fine color, high tensile strength and elongation, and all other properties which make it possible to substitute the ingots for the usual virgin metal additions very successfully. It is also stated that despite the very careful processing required to produce the ingots, the cost is not so high as to prevent its competition with other grades of remelt aluminum. The same process is being applied to production of various aluminum alloys, with equal results.

Bakelite Sealing Solution for Porous Castings

Bakelite Corporation, 247 Park Avenue, New York City, announces the development of a solution for treating porous or sweating castings of aluminum, nickel, silver, bronze, brass, etc. The process is said to make it possible to reclaim a considerable amount of cast work heretofore rejected. Pressure castings so treated are said to be brought up to full standard, capable of passing all examinations and tests. Bakelite sealing solution is stated to be insoluble and infusible after the treatment is applied, remaining unaffected by hot or cold water, steam, or temperatures up to 400° F. It is resistant to most chemicals, although special information should be obtained from the company when use for castings that are to be subjected to chemicals is contemplated. Sand or blow holes cannot be repaired with it.

The process is stated to be simple and economical. For aluminum and pressure castings which are porous or show "spongy" spots, the process consists of careful cleaning of the work, plugging so it can be filled with the solution, and applications of 250 pounds of air pressure after the casting is filled with solution. This forces the material into the pores. Lower pressures can be used where the castings will not withstand 250 pounds. Usually 2 to 5 minutes is required for completion of treatment, but a maximum of 30 minutes is mentioned. Solution is then drained, casting is washed out with alcohol to remove coating left, and castings are then baked at 275° to 300° F., for one to two hours.

The solution is made in two types: BE-2106 for aluminum and pressure castings, and BE-2106 for the copper alloys. The maker states the material has undergone complete research and scientific development, testing, etc. Readers can obtain full data by applying to Bakelite Corporation.

Sheet Zinc with Improved Bending Properties

"Flexzinc" is the name of a type of sheet zinc recently developed and placed on the market by the New Jersey Zinc Company, 160 Front Street, New York. The material is stated to have highly improved bending properties, being flexible in the extreme. The material can be bent with the grain or across the grain, according to the maker, giving it an advantage over ordinary high grade zinc sheet for numerous purposes. The new sheet is especially recommended by the maker for use where zinc might ordinarily be used if the usual sheet did not tend to crack in certain applications. Tests are said to have proven the material highly flexible and suitable for a wide variety of sheet-working purposes. It is furnished in all common gauges and sizes.

Metal Developments

CLOCK AND WATCH PRODUCTION of plants in Moscow Soviet Russia, last year was as follows: 43,000 pocket and wrist watches; 364,000 alarm clocks; 1,000 electric clocks. Materials were 90% of Soviet manufacture. Current year's output is scheduled at 72,000 watches; 3,000,000 gravity clocks; 500,000 alarm clocks, 1,000 electric primary clocks; 24,000 secondary clocks; 10,000 other clocks.

ALUMINUM trim is being used for overstuffed furniture by Jamestown Royal Upholstery Company, Jamestown, N. Y.

GALLIUM metal, heretofore a scientific luxury, is now available at 10 marks per gram due to a production process developed by Vereinigte Chemische Fabriken, Leopoldshall, Saxony. Wide industrial consumption is expected. Gallium has a very low melting point, very high boiling point; is nonpoisonous; is said to be useful for optical, dental, heat measuring, electrical and other purposes. Its cost of 175 marks a gram has hitherto restricted its use.

GOLD softened by additions of herb juices to a plastic consistency was used to mold, rather than beat, some of the art treasures recently found in Mexico, according to press dispatches. The mixture is said to be secret with the Mixtecan Indians.

SHEET ZINC has been selected for roofing for the new State Capitol building at Springfield, Ill. The metal will also be used for ornamental work. Contract requires about 100,000 pounds.

ALUMINUM cars and trucks are being used with considerable success in a variety of lines, including ore, coal, sulphur, liquid fuels, etc., according to "Research Narratives" of May 15, 1932, issued by Engineering Foundation, 29 West 39th Street, New York.

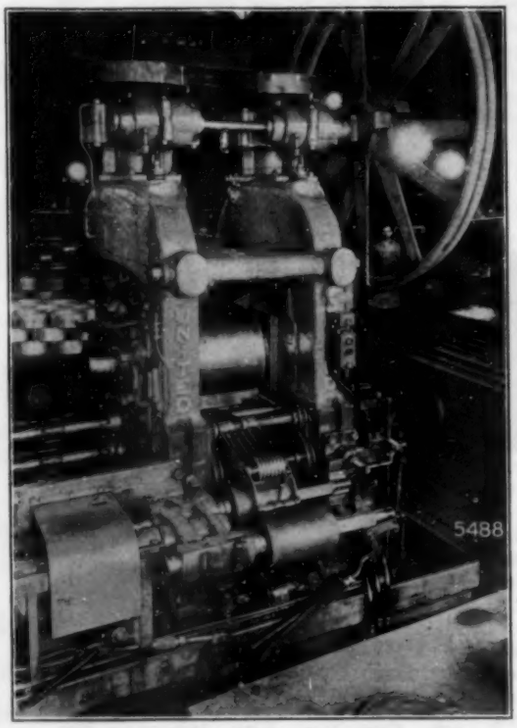
Single-Stand, 4-High Cold Rolling Mill

Increasing use of the single-stand, 4-high rolling mill, which is gradually supplanting the old 2-high mill, is reported by the United Engineering and Foundry Company, Pittsburgh, Pa. Since the introduction of the 4-high mill several years ago, hardly a two-month period has gone by without seeing some of this type of mill under construction at the United shops, it is stated.

While a considerable number of the machines have been installed in steel plants, wide use of the 4-high mill is being made in nonferrous rolling. Cold rolling of brass, copper, nickel, silver and other alloys is being done regularly on the single-stand, 4-high mill, with application to both roughing and finishing. Installations have been made in many parts of the country, including New England, Ohio, the Pittsburgh area and other midwestern points.

The machines are available in several arrangements, according to the service required of them. In small sizes they generally have hand screwdowns. Either constant or variable speed motors can be used. For nonferrous work a light reeling machine known as a blocker is used, while for steel a tension reel is provided. For heavy gauge material a roll coiler may be used.

The makers state that the machines are selling steadily due to their ability to introduce important economies in production. The advantages claimed include greater speed, heavy draft, fewer anneals, power savings, diminished fullness, crown or center, ability to turn out thin gauges and products not possible to make on other types of mill. With equal man power the 4-high mill is said to produce from two to four times the tonnage of good quality material as the machines supplanted.



Single-Stand Cold Mill with Automatic Blocker Used on Brass Strips by the Plume and Atwood Manufacturing Company, Thomaston, Conn.

While most installations have been single-stand units, space is usually allowed for additional stands in tandem. Tandem layouts can thus be anticipated without immediate investment, and a single stand operated meantime. It is pointed out that while there are places in all cold mill plants where this type of mill will not be suitable, nearly all such plants have work in which the 4-high mill can prove highly advantageous.

World's Largest Roll Lathe.

In connection with the above information about a product of the United Engineering and Foundry Company, it is of interest to note that this firm recently completed the largest roll lathe ever constructed. The machine is for producing rolls for tremendous steel rolling mills. Nominally a 70-inch lathe, as compared with a former maximum of 60 inches used in the industry, the big lathe ordinarily takes a roll 82 inches in diameter and 26 feet long overall. With slight modifications in tool equipment the lathe will swing a roll 88 inches in diameter. The lathe is 49 feet long.

Equipment and Supply Catalogs

Exhaust Fans. Duriron Company, Inc., Dayton, O. Bulletin 166. Acid resisting equipment.

Welding Supplies. Bastian Blessing Company, Chicago, Ill. Booklet on "Regorod" welding materials.

Gears. Farrel-Birmingham Company, Inc., Buffalo, N. Y. Bulletin 425 on high speed units. Illustrated.

Welding. Lincoln Electric Company, Cleveland, O. Section No. 3304, Arc Welding Supplies. Illustrated bulletin.

Lubrication. Joseph Dixon Crucible Company, Jersey City, N. J. "Auto-Marine" packing and cop graphited grease.

Capacitor Motors. Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, Mo. Loose-leaf bulletin, 6 pages, No. 167, part 6.

Testing Equipment. Morehouse Machine Company, York, Pa. Bulletin on proving instruments for checking materials testing machines.

Lead-Coated Copper. Copper and Brass Research Association, 25 Broadway, New York. Information for the architect and the sheet metal contractor.

Rubber. B. F. Goodrich Company, Akron, O. "A Wonder Book of Rubber." Fine illustrated pamphlet on history, manufacture and use of rubber.

Foundry Accidents. National Safety Council, Inc., 20 North Wacker Drive, Chicago, Ill. Bulletin: Accidental Injury Rates in the Foundry Industry—1931.

Testing Equipment. Baldwin-Southwark Corporation, Southwark Division, Philadelphia, Pa. Bulletin on Southwark-Emery Stress-Strain Recorder. Illustrated.

Pyrometers. The Foxboro Company, Wilson-Maeulen Pyrometer Division, Foxboro, Mass. Bulletin 182 on automatic temperature control pyrometers. Illustrated.

Grinding Wheels. Walter C. Gold, 235 Race Street, Philadelphia, Pa. Catalog No. 4. Contains considerable information of interest to wheel users. 32 pages, illustrated.

Shears. United Engineering and Foundry Company, Pittsburgh, Pa. Bulletin E-902, illustrated. Miscellaneous light shares for cropping, dividing and other operations.

Vertical-Horizontal Press. Watson-Stillman Company, 75 West Street, New York. Bulletin B-22, Ed. 2. Equipment for forcing, bending, straightening, die sinking and upsetting, horizontal forcing, forming, etc.

Manufacturing Expense Budget. Metropolitan Life Insurance Company, New York. A very fine booklet on the subject, giving résumé of the practices of four representative companies, including Doehler Die Casting Company and Norton Company.

Brazing Alloy. Handy and Harman, 57 William Street, New York. Bulletin No. 7 on "Sil-Fos," a compound for brazing copper and nickel alloys and other non-ferrous metals, which, the maker states, the patent office recognized as "the first and only brazing alloy containing phosphorus in combination with silver and copper."

News of Associations and Societies

Materials Testing Society

American Society for Testing Materials will hold its 35th annual meeting at Chalfonte-Haddon Hall, Atlantic City, N. J., June 20 to 24. The society's usual high standard will be maintained in the technical sessions, as well as in the entertainment features of the gathering. The provisional program lists the following papers of interest to the nonferrous metal and finishing industries:

First Session, Tuesday, June 21, 10:00 A. M.—Report of Committee E-1 on Methods of Testing.

Seventh Session, Wednesday, June 22, 4:00 P. M.—Edgar Marburg Lecture, "Fundamentals in the Problem of Resistance to Deterioration," by Prof. Hugh Stott Taylor.

Tenth Session, Thursday, June 23, 8:00 P. M.—Corrosion and Fatigue of Metals. Papers and reports: Report of Committee A-5 on Corrosion of Iron and Steel. Embrittlement of Hot Galvanized Structural Steel, by Samuel Epstein.

Report of Sectional Committee on Specifications for Zinc Coating of Iron and Steel.

Controlled Data from an Immersion Test, by R. F. Passano.

Some Factors Affecting the Preece Test for Zinc Coatings, by H. H. Walkup and E. C. Groesbeck.

Effect of Zinc Coatings on the Endurance Properties of Steel, by W. H. Swanger and R. D. France.

Twelfth Session, Friday, June 24, 9:30 A. M.—Nonferrous Metals. Reports of:

Committee B-1 on Copper Wire.

Committee B-3 on Corrosion of Nonferrous Metals and Alloys.

Committee D-14 on Screen Wire Cloth.

Committee B-4 on Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys.

Effect of Cold Working on the Izod Notched Impact Value of Monel Metal, by N. B. Pilling.

Influence of Recrystallization Temperature and Grain Size on the Creep Characteristics of Nonferrous Alloys, by C. L. Clarke and A. E. White.

Committee B-5 on Copper and Copper Alloys, Cast and Wrought.

Factors Affecting the Physical Properties of Cast Red Brass (85 Cu, 5 Sn, 5 Zn, 5 Pb,) by H. B. Gardner and C. M. Saeger Jr.

Thirteenth Session, Friday, June 24, 2:00 P. M.—Nonferrous Metals, Metallography. Papers and reports of committees:

Committee B-2 on Nonferrous Metals and Alloys.

Sectional Committee on Zinc and Zinc Ores.

Mechanical Properties of White Metal Bearing Alloys at Different Temperatures, by H. K. Herschman and J. L. Basil.

Committee B-6 on Die-Cast Metals and Alloys.

Committee B-7 on Light Metals and Alloys, Cast and Wrought.

Committee E-4 on Metallography.

Method of Preparation of Lead and Lead Alloy Cable Sheath for Microscopic Examination, by W. H. Bassett Jr., and C. J. Snyder.

New York Branch

At a meeting May 13, it was decided that no class in laboratory work would be established at this time. The Ways and Means Committee's recommendations as to business to be presented at the coming annual convention of the Society were accepted. An appropriation of $150 was made for expenses of three convention delegates.

The meeting was attended by Philip Sievering, president of the national Society, and considerable business between the Branch and the Society was transacted.

Technical discussion, mainly on cadmium plating, followed the business session.

JOSEPH MUSANTE,
Recording Secretary.

The Electrochemical Society

Too late for insertion in our full report of this Society's recent general meeting at Baltimore, Md., it was announced that new officers have been elected, as follows: R. A. Witherspoon, Shawinigan Chemicals, Ltd., Montreal, Que., president; Duncan McRae, E. M. Baker and Sterling Temple, vice-presidents; Acheson Smith, O. P. Watts and W. S. Landis, managers; R. M. Burns, treasurer; Colin G. Fink, secretary (re-elected).

Mechanical Engineers

The Connecticut Section of the American Society of Mechanical Engineers held a meeting last month at Waterbury, Conn. Many brass and metal plant men spoke, including. Michael Dempsey of the Chase Metal Works, Walter Childs of Scovill Manufacturing Company; J. R. Putnam of Waterbury Clock Company; Forrest G. Purinton of the Waterbury Button Company.

The following were elected as members of the executive committee from Waterbury: Herman Koester, vice-president, Bristol Company; F. G. Purinton, mechanical superintendent, Waterbury Button Company; W. K. Simpson, vice-president, Hoffman Specialty Company. The following were elected to the nominating committee for next year: William R. Bassett, American Brass Company; R. C. Perry, Waterbury Clock Company; J. R. Putnam, Waterbury Clock Company.

W. R. B.

National Metal Congress

The Machine Shop Practice Division of the American Society of Mechanical Engineers, under the chairmanship of F. C. Spencer of the Western Electric Company at Kearny, N. J., has voted unanimously to transfer the program which they had previously planned to hold at the Machine Tool Show in Cleveland to the National Metal Congress at Buffalo the week of October 3. In addition, the program which had been planned by the Society of Automotive Engineers to be held in Cleveland has also been transferred to Buffalo. The two societies in machinery and machine shop practice will present an outstanding program of particular interest to production men and superintendents.

In addition to the acquisition of these two societies, definite arrangements have been made by Charles Smith, president of the American Drop Forging Institute, to hold technical meetings of that Institute at Buffalo during the National Metal Congress. This is the first time that the Institute with its technical men has been affiliated with the Congress.

The National Metal Congress is sponsored by the American Society for Steel Treating and other organizations.

Metal Finding Association

Metal Finding Manufacturers Association, Providence, R. I., last month re-elected Ralph Gregory president. Other officers: F. A. Ballou, Jr., vice-president; William Whytock, treasurer; E. E. Baker, secretary.

British Institute of Metals

Professor Dr. F. Körber, Director, Kaiser Wilhelm-Institut für Eisenforschung, Düsseldorf, delivered the Twenty-second Annual May Lecture of the Institute of Metals in London, England, on Wednesday, May 11, on "The Plastic Deformation of Metals." The results of the researches set out in the lecture undoubtedly constitutes a considerable enrichment of knowledge of the subject of metal working. Copies of the May Lecture may be obtained on application to the Secretary, Institute of Metals, 36 Victoria St., London, S. W. 1.

Personals

Champion H. Mathewson

Champion Herbert Mathewson, James Douglas Gold Medalist of the American Institute of Mining and Metallurgical Engineers for 1932, was born in Essex, Connecticut, October 7, 1881. He graduated from the Sheffield Scientific School at Yale in 1902, and received the degree of Doctor of Philosophy, magna cum laude from Gengia Augusta University, Göttingen, in 1906, at that time studying in Germany as Austin Fellow of the Massachusetts Institute of Technology.

His first position after graduation from Yale was as a junior chemist with the Acker Process Company, Niagara Falls, New York. Since then he has held the following positions: instructor in chemistry, Massachusetts Institute of Technology, 1906-07; instructor in chemistry and metallography, Yale University, 1907-11; assistant professor, 1911-19; and professor since 1919.

He has served as consulting metallurgist for various companies during the last fifteen years, at present including the New Jersey Zinc Company and the Bell Telephone Laboratories, Inc.

Dr. Mathewson is a member of the following societies: American Association for the Advancement of Science, American Chemical Society, American Institute of Mining and Metallurgical Engineers, American Society for Steel Treating, American Society for Testing Materials, Connecticut Academy of Arts and Sciences, Institute of Metals (London), Society for the Promotion of Engineering Education, American Association of University Professors.

Pioneer work in introducing metallographic testing methods into the practice of non-ferrous metallurgy in a number of plants in the brass and zinc industry was performed by Dr. Mathewson, and he has played a prominent part in organizing the research work in some of these plants. He has made a particular effort over a considerable period of years in the direction of training selected young men through a period of graduate study in the Department of Metallurgy at Yale, for technical or research service with a specified company bearing a cooperative interest in the arrangement. Thus, studies which have been carried to fruition in the laboratories of the New Jersey Zinc Company, and have been largely responsible for the modern industrial development of zinc-base die casting alloys by directing attention to the purity of the metals used and the selection of preferred compositions, were started in this manner. A gradually increasing number of leaders in the field of non-ferrous metal research have passed through this school of preparation.

Most of Dr. Mathewson's scientific work has been on problems of constitution in the field of metals and alloys, and his published papers, about thirty in number, indicate an early period of activity in studying the equilibrium between phases occurring in various alloy systems; then a period devoted to consideration of mechanical properties, principally in relation to constitution; and finally a period of crystallographic investigation chiefly of zinc and related metals, which has clarified to a large extent structural changes occurring in these metals when they are broken down under stress.

CHAMPION H. MATHEWSON

Dr. Mathewson delivered the annual Institute of Metals Lecture in 1928 on the subject of Twinning in Metals. This lecture presented a review of the subject together with the results of original work demonstrating the great importance of twinning in the structural rearrangement accompanying mechanical deformation of some metals, notably zinc. Later, the true nature of the so-called Neumann bands as twin lamellae in ferrite was demonstrated by X-ray analysis. Messrs. A. J. Phillips, Van Horn, Edmunds, and other candidates for degrees in the Department of Metallurgy were active in this work.

Dr. Mathewson is the incoming chairman of the Institute of Metals Division, and has for several years been chairman of the Committee on Copper and Copper Alloys, Cast and Wrought, of the American Society for Testing Materials.

George L. Hurst, consulting mechanical engineer, of San Francisco, Calif., is now handling the sale of the Farrel-Sykes line of gears, speed reducers, gear drives and gear cutting machines in the San Francisco territory, for Farrel Birmingham Company, Inc., Buffalo New York.

J. R. Brown has been appointed sales representative for the Farrel-Birmingham Company, Inc., Ansonia, Conn., to handle sale of the Rafter patent press-brake and other types of mechanical and hydraulic metal working presses in the middle west territory. His headquarters are at the company's branch office, 2710 First Central Trust Bldg., Akron, O.

E. B. Freeman, formerly for many years vice-president and general manager, has been named president of B. F. Sturtevant Company, Hyde Park, Mass. He takes over the duties of former Governor Eugene N. Foss, who now becomes board chairman.

H. E. V. Porter, president of Dahlstrom Metallic Door Company, Jamestown, N. Y., has been appointed general manager also, to succeed the late John A. Westman, who was secretary and general manager. Sam **Lundquist** is now secretary.

Dr. Milton C. Whitaker, formerly vice-president of U. S. Industrial Alcohol Company, has been elected a vice-president and director of American Cyanamid Company, New York, filling the vacancy caused by the recent death of J. M. Selden.

Obituaries

Gus Creutz

Gus ("Old Timer") Creutz, district manager at Detroit, Mich, for The Meaker Company, Chicago, Ill,, died of heart failure on March 19, 1932. Entering the electroplating field at 18, he was identified with the industry for about 40 years. He was with the American Lacquer Company for a time. Later he was vice president of the Bennett and O'Connell Company. He then joined Frederic B. Stevens, Inc. For the past 15 years he was with Meaker, the last five of which he spent as Detroit manager.

Walter P. Bryan

Walter Peck Bryan, director of the American Hardware Corporation, Plume and Atwood Manufacturing Company, and an official of numerous other companies, died recently, aged 57.

William C. Harrison

William C. Harrison, vice-president of Oxweld Acetylene Company, and eastern manager of Linde Air Products Company, New York, died in that city recently, aged 41.

Obituaries

William Spencer Ward

William Spencer Ward, president of the Boissier Electric Corporation, New York, plating and polishing equipment and supply firm, died April 22, 1932, at Montclair, N. J., after a short illness. He was 47 years of age.

Mr. Ward was born in 1885, the son of Waldron A. Ward, who was treasurer of the Hanson-Van Winkle Company previous to that company's merger with A. P. Munning Company to form the Hanson-Van Winkle-Munning Company, now at Mattawan, N. J. After the merger, his father remained a director. William S. Ward graduated from Princeton in 1907, and joined his father in the Hanson-Van Winkle Company, where he stayed for about twenty years. In 1927 Mr. Ward joined the Boissier company as president, remaining in that position until his death.

All who knew Mr. Ward appreciated his fine character. Always charming, it was his desire to continue the atmosphere of friendliness he had always helped to create, and in his will he ordered that the funeral be simple and inexpensive, an occasion of sociability rather than sadness.

He is survived by his widow, Mrs Florice B. Ward, his mother, and two sisters.

Jesse J. Armstrong

Jesse J. Armstrong, for many years connected with the Rome Brass and Copper Company, Rome, N. Y., now part of Revere Copper and Brass, Inc., died recently, aged 64. He was vice-president of the Rome Company from 1920 until it was merged with Revere. Starting in 1884, he held various positions with the brass concern, and progressed steadily. He became a salesman in 1892, and a director in 1908. In 1917 he was made secretary, and in 1920 vice-president. He had a host of friends in the industry throughout the country.

Morris Slepkow

Morris Slepkow, expert on face grinding equipment, died recently in Philadelphia, Pa. For over 30 years Mr. Slepkow was connected with Diamond Machine Company, Providence, R. I. He left Diamond to enter the employ of Bridgeport Safety Emery Wheel Company, in 1931. He had latterly been engaged in the service and sale of face grinders and other grinding machines.

Edward H. Crosby

Edward H. Crosby, vice-president of Veeder-Root, Inc., Hartford, Conn., died at that city, April 30, 1932. He was 64.

Mr. Crosby started as a machinist, working in Boston and New York. He joined the Veeder Manufacturing Company in 1895, as superintendent. At the time of his death he was the firm's oldest employee in years of service.

Louis Mertens

Louis Mertens, founder of the Keystone Brass Company, Erie, Pa., died at the age of 77 on April 22, 1932. Mr. Mertens came to Erie from Germany when he was fifteen. He received his early industrial training at the Hays Manufacturing Company, Erie, and became a brass finisher. He studied in his spare time, and learned mechanical drawing and other subjects. Eventually he was made superintendent of the Hays plant, and served in that capacity for 23 years.

LOUIS MERTENS

Mr. Mertens then went into business with the late C. F. Bostwick, forming the Keystone Brass Works. When his partner died in 1907, Mr. Mertens took over his interest and incorporated the firm as Keystone Brass Company. He sold his business and retired in 1916.

Mr. Mertens is survived by a son, Oscar, and two daughters.

John J. Lebherz

John J. Lebherz, 77, former president of the Niagara Frontier Brass Company, Niagara Falls, N. Y., died on April 10th following an operation. He was long prominent in metal circles before his retirement.

Rinaldo C. Castiglioni

Rinaldo C. Castiglioni, former Providence, R. I., jewelry manufacturer, died at Providence recently, aged 66. He came from Italy and settled in Providence more than 50 years ago. He was one of the first of his nationality to enter the jewelry manufacturing line in Providence.

Clinton B. Buckingham

Clinton B. Buckingham, head of the shipping department of the tube mill of The National Electric Products Corporation, New Jersey, died recently, aged 56, of heart failure.

Mr. Buckingham was connected with the copper industry for many years. Entering the employ of the Bridgeport Brass Company, Connecticut, as chief inspector of the seamless tube mill, he remained there from 1905 to 1918, when he joined the Bridgeport Tube Works in a similar capacity. In 1919 he went to the British American Metals Company, Plainfield, N. J., as chief inspector, and later became head of the seamless tube department. He remained when National Electric Products took over the company in 1928. National Electric is now a subsidiary of Phelps Dodge Corporation, New York.

Mr. Buckingham was known by probably every inspector in the tube industry in the United States, due to his long experience in the field. Pleasing in personality, he had a very large circle of friends.

Theodore Koven

Theodore Koven, president of L. O. Koven and Brother, Jersey City, N. J., boiler and sheet metal products manufacturers, died last month while attempting a scientific expedition over Mount McKinley, Alaska, in company of Allen Carpe and other members of a group interested in cosmic ray research. The sad outcome of the venture, as well as the considerable achievement of Mr. Koven and his associates, was the subject of world-wide news for several days.

Theodore Koven graduated from Stevens Institute of Technology in 1926, and entered his father's business. When his father died some years ago, the young man became president. He is survived by his brother, Gustave Koven, and his mother.

William Passmann

William Passmann, 77, founder of the Leoffelholtz Company, Milwaukee, Wis., brass foundry, died May 16, 1932, at his home in that city. Mr. Passmann remained chief stock holder of the Loeffelholtz Company until 10 years ago when he retired. His son, Andrew Passmann, has been superintendent of the company's foundry for 28 years. Besides his son Andrew, he is survived by his widow and five other children. W. T. N.

Clarence T. Fletcher

Clarence T. Fletcher, superintendent of the tube mill of the United States Aluminum Company, New Kensington, Pa., died at his home in that city recently, aged 42 years.

Industrial and Financial News

Precious Metals Thieves Rob Two New York Firms

Raw gold and platinum valued at $25,000 was stolen from the Dental Gold Manufacturing Company, Brooklyn, N. Y., last month by robbers who blew open two of the firm's safes at night. A third safe was damaged by an unsuccessful attempt to open it. The tools were found scattered about the place, and other signs indicated the robbers worked in a leisurely fashion, the building being without a night watchman.

Another precious metals robbery occurred in New York last month when the establishment of Moe Hammerschlag, Inc., 174 Park Row, Manhattan, was held up and about $15,000 in precious metals and cash was taken. The robbers escaped. The firm states the loss was covered by insurance.

Pacific R & H Chemical Elects New Officers

Pacific R & H Chemical Corporation, El Monte, Calif., a subsidiary of Roessler and Hasslacher Chemical Company, New York, announces the following officers were elected at a recent board meeting: C. K. Davis, chairman; Dr. E. A. Rykenboer, president; F. S. Pratt, vice-president; A. Frankel, treasurer; H. A. Schumacher, assistant treasurer; L. Rice, secretary; J. L. Fahs, assistant secretary.

New Doehler Die Casting Company Directors

At the annual meeting of Doehler Die Casting Company, New York, last month, Henry Nias, W. C. Beschorman, Franklin Conklin, Jr., and M. D. Howell, were elected directors. They succeed P. V. Shields and L. H. Morin resigned. Other directors were reelected.

European Aluminum Foil Makers Renew Pact

The European Aluminum Foil Convention, under which practically all central European makers maintain an export price agreement, has been renewed, the first year of its operation having expired recently. About 28 mills belong.

First Russian Aluminum Plant in Production

The first plant for aluminum production in Soviet Russia has been put in operation at Volkhov, near Leningrad. The development is said to be the forerunner of early independence of Russia of foreign supplies of the metal, in line with the Five Year Plan. Original plans for a 1932 output of 8,000 metric tons have been revised, the Volkhov plant being able to produce this amount itself, and it is now expected that the aluminum development under way in connection with the Dneprostroy power project will ultimately provide aluminum producing capacity of 20,000 metric tons annually. Besides metal, aluminum oxide and paint will be produced.

International Aluminum Prize Competition

Three prizes totaling 20,000 Swiss francs (about $4,000) will be given by a group of European producers for best suggestions for stimulating use of aluminum and development of the industry. The competition is open to persons of all nationalities. Full details are available from Bureau Internationale de Propogande de l'Aluminium, 23 Rue de Balzac, Paris, France; and from British Aluminium Company, Ltd., Adelaide House, King William Street, London, E. C. 4, England.

New Ingot Metal Plant

Louis Lowenstein, Inc., 56-60 Water Street, Brooklyn, N. Y., recently organized, is in operation, producing brass, bronze and composition ingot, german silver, manganese bronze, pig lead, solder, babbitt, type metal and spelter. Headed by Louis Lowenstein, formerly with Nassau Smelting and Refining Works and Tottenville Copper Company, the plant has 18,750 square feet of space, is fully equipped for modern methods of production. Associated in the company are Arthur Lowenstein and Harry Zuckerman, also formerly with the Nassau and Tottenville companies.

To Favor Local Foundries in Brooklyn Contracts

Local industries of Brooklyn, N. Y., will be given preference in awards of municipal contracts for brass and foundry work, due to a resolution adopted through efforts of the Brooklyn Chamber of Commerce. The Chamber is urging similar action with regard to other Brooklyn industries.

Industrial Cleanliness

Cash awards for exemplary plans for increasing cleanliness in industries are announced by Cleanliness Institute, 45 East 17th Street, New York, from whom full details of the idea are available. The Institute is interested in raising cleanliness standards among industrial employes.

Aluminium, Ltd., Runs at 50%

Operations of subsidiaries of Aluminium, Ltd., of Canada, were at 50% of normal at the beginning of May, according to press reports from Montreal.

Corporation Reports

Profits

Net profits of incomes reported by corporations for the three months ended March 31, 1932:

NEW JERSEY ZINC COMPANY, New York: $591,104, against $860,769 for same 1931 period.

PARKER RUST-PROOF COMPANY, Detroit, Mich: $96,116 surplus, against $208,830 March 31, 1931.

INTERNATIONAL NICKEL COMPANY of Canada, Ltd.: $536,071, against $1,659,637 last year.

WESTERN CARTRIDGE COMPANY, East Alton, Ill.: Net income for 1931, $883,279, not including Winchester Repeating Arms Company, which was acquired December, 1931. Compares with $878,700 for 1930.

Losses

Net losses for the quarter ended March 31, 1932, were reported as follows:

INTERNATIONAL SILVER COMPANY, Meriden, Conn.: $461,808, against net loss of $148,947 for first 1931 quarter.

YALE AND TOWNE MANUFACTURING COMPANY, Stamford, Conn.: $158,937, against net income of $7,947 for same 1931 period.

GENERAL CABLE CORPORATION, New York: $850,169, against $697,965 net loss for same 1931 period.

BOHN ALUMINUM AND BRASS CORPORATION, Detroit, Mich.: $73,201, against net profit of $437,296 for same 1931 period.

UNION METAL MANUFACTURING COMPANY. For year 1931, net loss of $91,496, against net profit of $260,906 for 1930.

BALTIMORE TUBE COMPANY, Baltimore, Md.: $52,084, against $15,423 net loss in 1931 period.

REVERE COPPER AND BRASS, INC., New York: $375,600, against $85,094 net loss in 1931 period.

WALWORTH COMPANY, Boston, Mass.: $217,969, against $539,905 net loss in 1931 period.

Dividends

Quarterly dividends payable July 1, 1932 were declared as follows:

UNITED ENGINEERING AND FOUNDRY COMPANY, Pittsburgh, Pa.: 50 cents on common, placing issue on $2 annual basis, against $3 previously.

DOW CHEMICAL COMPANY, Midland, Mich.: 50c., on common, payable May 16.

ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa.: 75 cents on preferred; no charge.

NATIONAL LEAD COMPANY, New York: $1.25 on new common; $1.50 on new class B preferred.

SCOVILL MANUFACTURING COMPANY, Waterbury, Conn.: 37½ cents, as against 50 cents previously.

U. S. FOIL COMPANY, Louisville, Ky.: 7½ cents on class A and B common.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

JUNE 1, 1932.

The **American Ring Company,** one of the city's oldest industries, has closed indefinitely except for one or two departments which will handle such orders as may continue to come in. **John M. Burrall,** treasurer and general manager, denies that the concern is insolvent or that it is going out of business entirely and permanently. The shutdown is forced by lack of orders.

The committee to secure renewal of pledges for the relief of the unemployed, which expired May 1, reports that almost as much an income is assured as during the past year and one-half. Practically all who are employed contribute from 1 to 3 percent of their wages. Also, Scovill, American Brass, Chase, and most other large concerns have again agreed to contribute from their treasuries sums equal to those contributed by their employes.

United States Senator Bingham has promised local clock and watch manufacturers that he will use his best efforts to have included in the tax bill a 10 percent levy on imports of clock and watch parts. The best that can be hoped for, he said, is a provision to make certain that importers will, at least, be under the same burden as domestic makers of clocks and watches. The tax bill already carries such a tax on watches and clocks made in this country.

Reports of an unusually large order received by the **Scovill Manufacturing Company** were pronounced false by officials last month. Practically all buying of brass products remains on a hand-to-mouth basis. Customers of local plants, instead of placing orders for some months ahead, to be delivered regularly over a long period, as they used to do, now wait until the last minute and then send a rush order which must be gotten out and shipped right away.

Among patents granted local inventors during the month are: Receptacle for ashes and other refuse to Ruth Gerth, assigned to the Chase Companies; Charles T. Brennan, cut off mechanism for heading machines; Albert Post, flashlight plug; Allen R. Ruffin, atomizer support.

Stockholders of the **Beardsley and Wolcott Manufacturing Company** have been asked to approve a plan for the exchange of the company's 7 percent debentures for preferred stock, to save about $28,000 annually in interest charges. Debenture holders have agreed. This would leave about $205,000 of preferred stock outstanding ahead of the common, but no other bonds or funded debt.

Local manufacturers have received a letter from E. Kent Hubbard, president of the Manufacturers Association of Connecticut, warning them that more radical and confiscatory legislation than has ever been heard of before will be presented at the next legislative session. Accordingly, he urges them to take a more active part in selection of candidates for the legislature, to see that those with conservative and constructive ideas are chosen.—W. R. B.

Connecticut Notes

JUNE 1, 1932.

HARTFORD—Automatic Signal Corporation has received orders for signalling devices for the City of Medford, Mass., aggregating $29,460. **Veeder-Root Company** will manufacture the equipment. The latter is now manufacturing counting devices for rowing machine exercisers and for electric refrigerators sold on the installment basis.

Underwood Elliot Fisher Company has declared a 25 cent dividend on common stock, payable June 30. The company paid 50 cents a share the preceding quarter.

Pratt and Cady Company, subsidiary of **American Chain Company,** Bridgeport, is having a survey made of the plant requirements as to manufacturing space, cost of manufacturing operations, etc. This has given rise to a report that the business may be moved from Hartford, which is denied by **Charles H. Blanchard,** general manager. The company manufactures brass and iron castings, and valves. It employs 300 mechanics and is operating four or five days a week.

BRISTOL—The plant of the **New Departure Manufacturing Company** closed for the week last month. About 2,200 employes were affected. They have been working about 32 hours a week. The company has closed its plant at Elmwood, near Hartford, and moved the business to the Meriden plant.

Sessions Clock Company, employing about 300, closed last month for a week. It has been operating about three days a week.

NEW BRITAIN—American Hardware Corporation has called a stockholders' meeting for the 15th to authorize the directors to acquire up to 50,000 shares of stock for resale to employes. This is interpreted as meaning that the officials feel the present price of the stock is below its true value, and is also taken as an indication of confidence in the future earning capacity of the concern.

G. E. Prentice Manufacturing Company, manufacturers of slide fasteners, is issuing a house organ telling of new applications of the fastener to merchandise, and describing the sources of supply for this item.

BRIDGEPORT—Liberty Building Corporation and the B. P. C. Corporation have taken over the **Locomobile Company** plant through negotiations with the Locomobile bondholders' protective committee. They will sublet the property in small parcels, hoping to provide facilities for growing factories.

Col. Louis J. Hermann, works manager of the **Remington Arms Company,** who has been with the concern 24 years, has retired. **W. A. Tobler** of New Haven, recently elected vice-president and general manager of the company, will take over his duties. Mr. Tobler was formerly an official of the **Winchester Repeating Arms Company.**

NEW HAVEN—Winchester Repeating Arms Company, recently acquired by **Western Cartridge Company,** has added 500 employes to its payroll since January 1, according to **Albert J. Snyder,** personnel manager.

TORRINGTON—American Brass Company plant here has made a cut in wages ranging from 5 to 10 percent. **Hotchkiss Brothers Company** has made a straight 10 percent cut.

STAMFORD—Yale and Towne Manufacturing Company reports a net loss of $158,937 for the first quarter of the year, compared with net earnings of $7,947 for the same quarter last year.

Stamford Rolling Mills is temporarily operating departments on overtime schedules, and has organized a night force for some requirements. **General Manager James O. McCue** says the condition is only temporary.

MERIDEN—International Silver Company reports net loss of $461,808 for first quarter of 1932, compared with net loss of $148,947 for the same quarter of 1931. W. R. B.

Providence, Rhode Island

JUNE 1, 1932.

A voluntary petition in bankruptcy was filed a few days ago in the United States District Court here by the **Stephens Bolt and Nut Company,** 655 High street, Central Falls.

Horace M. Peck, secretary of the Manufacturing Jewelers' Board of Trade, has been appointed temporary receiver for the **Bassett Jewelry Company,** manufacturing jewelers, 80 Baker Street, Providence, on petition of Clarence J. Roehr and Walter C. Crooks, both of Cranston, R. I., creditors of the corporation.

Damage to the extent of several hundred dollars was caused by fire, smoke and water in the three-story brick building, at 4-16 Read Street, Providence, occupied on the second floor by the **D. & M. Jewelry Company,** of which **Samuel Montaquilla** is the owner.

Z. Berberian Company has had its charter amended to allow an increase of capitalization from $12,000 to $16,000 divided into 160 shares of stock at par value of $100.

Manchester Silver Company has been granted a permit to erect an addition to its factory building at 49 Pavilion Avenue, Providence.

Universal Supply Company is a new firm at 9 Calendar Street, for stamping and forming for the manufacturing jewelry trade.

Waite, Evans Company, manufacturing jewelers, have removed from 95 Chestnut Street to the Doran building, 150 Chestnut Street.

H & H Screw Products Manufacturing Company has located at 1883 Mineral Spring Avenue, North Providence, with well equipped plant for screw machine work for jewelry manufacturers.

Scannevin and Potter, Providence, have been awarded the contract by the Courthouse Commission to furnish 58 electric clocks for the final wing of the new Providence County Courthouse, besides the clocks to be placed in the tower of the new structure. Their bid was $11,337 the lowest of five. With the completion of the structure there will be 134 interior clocks in addition to those in the tower, 75 having been installed in the first wing by the **Tilden & Thurber Corporation,** Providence, whose bid on the present contract was $11,986.

John F. Allen and Son, Inc., has been incorporated under the laws of Rhode Island with capital stock of $32,000, consisting of 320 shares of preferred stock at $100 each and 100 shares of common of no par value. Incorporators are **Roger T. Clapp, Mason B. Merchant** and **Noel M. Field,** all of Providence.

Rose Jewelry Company, 7 Eddy Street, Providence, is owned and conducted by the **T & R Jewelry Co., Inc., Louis Garfinkle,** president, and **Angelo Rossi,** treasurer.

Liberty Tool and Gauge Works, Inc., of 235 Georgia Avenue, Providence, formerly of Woonsocket, has been petitioned into receivership, and Presiding Justice Edward W. Blodgett of the Superior Court has named **Alexander Keema,** Providence, receiver.

W. H. M.

Western Massachusetts

JUNE 1, 1932.

A decided slump occurred in employment at the 26 metal working concerns in Western Massachusetts during the past month.

Good orders from the automotive industry have been received at the **United American Bosch** plant. Business is better in the radio department following the marketing of a new small desk set.

Automotive orders have also aided activity of the **Van Norman Machine Tool Company.**

Wico Electric Company is reducing its working force due to a decrease in orders.

Gilbert and Barker Company is faced with the possibility of a summer shutdown. Sales are off considerably.

Contrary to rumors, the Chicopee Falls plant of the **Stevens Arms Company** will not be shut down. The plant, operating until recently 54 hours a week, is now running 40 hours, and will continue thus without reductions in personnel.

Bausch Machine and Tool Company's business has been on the uptrend the past month; no indication of a decline is seen.

Rolls-Royce of America, Inc., has suffered a marked decrease in sales. Officials believe orders will increase shortly.

Westfield Manufacturing Company's business is somewhat slower than last month. **Central Specialties Company** activities are brisk. New orders are coming in rapidly.

A special sales campaign by employees of the **Westinghouse Electric and Manufacturing Company** has boomed sales somewhat, and business at the East Springfield plant is pleasing to the officials.

Hermann Waker, a vice-president of **United American Bosch Company,** has been elected treasurer to replace **Morris Metcalf,** previously a vice-president and also treasurer, who continues in the former office, and, through release from the financial details, will be enabled to devote all his time to radio business.

Hugh Benet of Worthington Pump and Machinery Corporation, Holyoke has been reelected president of the Western Massachusetts branch of the National Metal Trades Association. The following other officers were chosen: first vice-president, **Edward L. Stoughton** of the Wico Electric Company, West Springfield; second vice-president, **G. J. Lang** of United American Bosch Corporation; treasurer, **Charles R. Hastings** of Hastings and Schoen Company.

Fred C. Doolittle has been chosen works manager of Wico Electric Company, West Springfield. **Leonard E. Vincent,** formerly assistant superintendent, has been promoted to superintendent.

Charles P. Russell, part-owner of the John W. Russell and Sons Company, Springfield, died at his home at the age of 59, following a long illness. Mr. Russell was treasurer of the Metal Trades Association branch of Western Massachusetts.

Westinghouse Electric and Manufacturing Company reports astonishing success in a drive by all its employees to sell household appliances. Hundreds of units have been disposed of by the workers.

G. B. Y.

Middle Atlantic States

Central New York

JUNE 1, 1932.

A contract to supply service bars for army men who served in the Spanish American War was won by the **American Emblem Company,** Utica, who will turn out more than 14,000 of the bars to be delivered to the quartermaster at Philadelphia. Orders for smaller lots of Philippine and Spanish War medals went to a Chicago firm.

Remington Typewriter Works is reducing its working operations to a limited force, according to a statement made by **Albert Ross,** superintendent of the plant.

George C. Hodges, Utica chemist, is president elect of Utica Rotary Club. He presided May 20, when **Bradford H. Divine,** head of **Divine Brothers Company,** gave a talk on the experiences of his boyhood days, describing his penchant for big game hunting.

Edward D. Ibbotson of **Horrocks Ibbotson, Inc.,** fishing tackle manufacturers, spent several days in Washington in an effort to see that the tax of 10 per cent on fishing rods, reels and equipment eliminated from the tax bill stays out of it when finally passed.

William S. Murray, head of **William S. Murray, Inc.,** which is recovering indium in commercial quantities, explained the process of recovery before the University Club in Utica.

At the Industrial Association of Utica it was reported that the metal trades in the city are about marking time. The **Savage Arms Corporation** is working full time, but reports from other factories offset this. According to the association, conditions in Rome are slightly worse at present than they have been in the past.

E. K. B.

Trenton, New Jersey

JUNE 1, 1932.

The majority of persons working in the metal trades have had to take wage cuts, and manufacturers believe that this may have some effect on business.

Following concerns have been incorporated: **A. B. Mason, Inc.,** Perth Amboy; metals; $10,000. **Charles Davis, Inc.,** Atlantic City; manufacture jewelry; 500 shares no par.

C. A. L.

Newark, New Jersey

JUNE 1, 1932.

Some of the metal plants report increased business, while others say there has been no change. **Benjamin E. Jarvis,** manufacturer of machines and metal patterns at 133 Mechanic Street for the past seventeen years, has taken a new plant at 74-80 Malvern Street.

Following Newark concerns have been chartered: **Pierson, McFarlane, Inc.;** metal products; 3,000 shares common. **Excel Metal Corp.;** metal products; $100,000. **Union Wire Frame Co.;** wire products; $125,000.

C. A. L.

Middle Western States — Pacific Coast

Detroit, Michigan

JUNE 1, 1932.

Industrial operations here during the past month developed no outstanding features, but manufacturing has made some progress. Everything centers around the automobile industry. Outside of this, it has been exceedingly quiet. Little is in progress in the plumbing supply or jewelry manufacturing fields. Platers have been a little more active owing to demand from the auto industry. Accessory plants, although making some progress, have no difficulty keeping up with demand. It is evident that most of the automobile concerns have reached the height of their activities—for the spring season at least. No one can forecast conditions for the next few months. With the exception of one major concern, production seems to show signs of tapering off. It is quite plain now that motor car production will not meet the expectations forecast for it earlier in the season.

The refrigeration industry seems to be having the most success. Production in this line is showing progress from month to month, and at the present time most of the plants report increases.

Shipment recently by the **Norge Refrigerator Company** of five trainloads of refrigerators, requiring approximately 140 freight cars, made a daily record, according to an announcement at Muskegon. The 8,000 units were valued at $1,500,000, president Howard E. Blood, of Detroit said. The Muskegon plant is now averaging production of 36 carloads a day.

A 350 per cent increase this year over last year in production and sales of **Gibson** refrigerators is reported from Greenville, Mich. Total shipment from the **Kelvinator** plants in Grand Rapids and Detroit for the last three months were ten per cent ahead of those from the same period in 1931. The **Leonard** plant is employing 1,280 men, working in two shifts of ten hours each. The Detroit plant of the Kelvinator is employing 1,860 men on one ten-hour shift. Both plants are working six days a week. The business spurt of the Gibson refrigerator at Greenville dates back to last fall. At that time the company took aggressive measures to open its sales outlets throughout the country. Under the leadership of **Frank H. Gibson,** vice-president in charge of sales, the entire sales staff was reorganized and as a result of extensive sales and advertising the factory has been running every night and day of the week for the last two months.

John A. Moore, for four years manager of the **Acme Foundry Company,** Detroit, severed his connections with that concern recently to engage in private consultation service. Before becoming associated with the Acme he was engaged in consulting work in the foundry industry. During the last four years Mr. Moore has been making nickel and chromium dies. Recently he perfected the manufacture of castings from a new alloy known as "Ni-Resist," sponsored by the **International Nickel Company.** This alloy is heat resisting, non-magnetic, non-corrosive.—F. J. H.

Toledo, Ohio

JUNE 1, 1932.

The past month in the plating and non-ferrous metal industry proved to be, in a moderate way, somewhat better than the preceding period. But the reports are not exciting. The bulk of the business came from the automobile industry, and centered around the accessory plants. Orders at present, however, seem to be on the decline, and the next month may not be quite so encouraging. From every source it would seem that manufacturing in every line will do well if it shows any progress at all during the late spring and summer months.

John N. Willys, chairman of the board of the **Willys-Overland Company** here, has resigned as United States Ambassador to Poland, to devote all his time to company affairs. Mr. Willys and associates will assume control of the company July 1. F. J. H.

Wisconsin Notes

JUNE 1, 1932.

An order for giant nuts was recently filled by **Ampco Metal, Inc.,** Milwaukee. Said to be the largest aluminum bronze alloy castings ever made in this part of the country, these screw-down nuts were sent to a rolling mill in the Chicago district. Each rough casting weighed 4,700 pounds and each needed 7,500 pounds of molten metal. The castings were poured at night in order to obtain sufficient electric energy, according to **C. J. Zaiser,** president and general manager. The combined capacity of the company's four electric and eight crucible furnaces was required to melt the necessary metal. It took three days to cool the castings and actual time consumed in melting the metal totaled six hours, with all furnaces going full blast.

According to Mr. Zaiser, business in April showed a pick-up over the average of the first three months and the trends of the second quarter promised better business than that offered by the first. The company's sales of non-sparking tools, used in the oil industry and also in powder plants, doubled those for the same quarter of last year. W. T. N.

Los Angeles, Calif.

LOS ANGELES, JUNE 1, 1932.

California Art Bronze Foundry turned out a large bronze statue of Filipe de Neve, founder of Los Angeles, which has been set up in the Plaza.

Hamilton Manufacturing Company, which has plants in Wisconsin and Los Angeles, has taken over steel hospital furniture production of **Albatross Steel Furniture Company,** West Los Angeles.

Druwhit Metal Products Company, 4605 East 48th Street, has a new plant for producing window products.

George Fisher will produce dental instruments at 747 South Hill Street.

Booth Radio Clock Company, 2309 Hyde Park Boulevard, will manufacture electric clocks.

Fishel Company, 704 Market Street, San Francisco, has started jewelry manufacture.

Enterprise Plating and Enamel Works, 780 22nd Street, Oakland, Cal., has started business, specializing in chromium. **Lawrence Miller** is manager.

Merco Nordstrom Valve Company plant at Oakland has been purchased by **Pittsburgh** (Pa.) **Equitable Meter Company,** maker of gas regulators and meters.

Metal Office Furniture Company, Grand Rapids, Mich., has opened a branch factory at 1014 4th Avenue, Seattle, Wash. **R. M. Devin** is manager.

Mechanical Products Company, 1738 First Avenue South, Seattle, Wash., has started making tools and dies.—H. S.

Other Countries

Birmingham, England

MAY 23, 1932.

Little change is noticeable in the non-ferrous metals industries. A development of interest is that a German firm is expected to build a works in Walsall, a Midland town, for the rolling of sheet brass. The local authority has offered a site of about five acres and negotiations are almost complete. If the scheme matures some five hundred men will be engaged in a works which will be electrically operated, apart from one or two gas furnaces.

The brassfounders of Birmingham and the surrounding district report a very slight improvement in the volume of business moving, but it is mostly with the home trade, as export business continues dull. At home a few projects are being given out which were suddenly put aside when the cry for economy became so insistent a few months ago. Financial stringency is still acute, but there are signs that a few contracts are about to be placed.

Brass fittings used in municipal housing estates are not as brisk as manufacturers would like, but the local authorities are proceeding very cautiously along the lines of expenditure.

Chromium plating continues popular and its use daily grows more widespread. It is the standard finish on many motor car and bicycle parts. Bicycle makers are having a good season. J. A. H.

Business Items—Verified

Merck and Company, Rahway, N. J., is building a research laboratory building, 40 by 80 feet, 2 stories.

United States Cartridge Company, New York, obtained a tax refund of $836,980 for 1918, as a result of a United States Supreme Court decision.

Allington and Curtis Manufacturing Company, Saginaw, Mich., makers of dust collecting and exhaust systems of various types, is celebrating its forty-sixth anniversary.

Aluminum Company of America, Pittsburgh, Pa., announced a 10 per cent reduction in wages and salaries, effected June 1, 1932. It affects employes of company and all subsidiaries.

August Wendall Forge, Inc., Brockway, Pa., hand forged aluminum and other metals, has plans for a one-story plant, 60x160 ft., at Grove City, Pa., and will remove to new location July 15th.

Ludlow Valve Manufacturing Company, Troy, N. Y., sustained damage to the roof of its brass foundry when fire, believed to have been caused by a cupola spark, broke out one night last month. Damage was not severe.

O. D. Conover, for the past 3 years vice-president of **Foundry Equipment Company,** Cleveland, Ohio, has established a consulting engineering service on design and layout of foundries and industrial plants.

Graphol Products Company, Inc., maker of rust solvents and lubricants, has moved to new headquarters at 408 DeKalb Avenue, Brooklyn, N. Y. This firm operates the following departments: brass machine shop, tool room, cutting-up shop, spinning.

International Nickel Company, 67 Wall Street, New York, has developed a special quality nickel with improved spinning qualities, being considerably softer, with less tendency to harden in working. It can also be effectively torch annealed, it is stated.

American Lead Corporation, Indianapolis, Ind., soft lead and antimonial lead producer, has been acquired by **National Lead Company,** New York, and will continue operations as a subsidiary. Management and purchasing will continue under **Max Robbins.**

Harry Blumenthal Company, 32nd Avenue South at 27th Street, Minneapolis, Minn., are now representing **L. A. Cohn and Brothers, Inc.,** 5429 Roosevelt Road, Chicago, Ill., on the sale of brass, bronze and aluminum ingot, printer's metal, babbitt, solder, die cast metal, etc.

Lighting Appliance Company, 9 Desbrosses Street, New York, manufacturer of electric lighting fixtures and equipment, is considering branch plant at Montreal. Cost over $35,000 with equipment. The following departments are operated: casting shop, plating, polishing, lacquering.

Gordon Metals Corporation, Milwaukee, Wis., reports increases in shipments of brass, bronze and aluminum, bringing company's total business during the early months of 1932 to considerably above the comparable 1931 figures. Lead, zinc and babbitt lines are slow. Company is a refiner.

Cohoes Rolling Mill Company, Cohoes, N. Y., denies trade reports that it has suspended production of wrought iron pipe, to devote entire attention to galvanized products. The wrought iron pipe is still being produced and there is no intention of any change, according to **A. Macfadyn,** vice-president.

Consolidated Stamping Company, 2755 West Fort Street, Detroit, Mich., has been organized by **Abraham Vizvary,** 79 Eason Avenue, Highland Park, Mich., and associates to manufacture steel stampings and other metal products. This firm will operate the following departments: stamping, tinning, lacquering.

Poole Foundry and Machine Company, Woodberry, Baltimore, Md., has been formed to conduct the business of the former **Poole Engineering and Machine Company,** general founders and machinery builders. Officers: **S. P. Brady,** president; **S. P. Brady, Jr.,** vice-president; **L. M. Ricketts,** secretary-treasurer.

Apco Mossberg Corporation, Attleboro, Mass., has developed a number of extruded aluminum silk mill accessories and reports successful use of the equipment in numerous installations. Company operates tool room, stamping, plating, polishing, grinding, lacquering, japanning and forging departments. **J. G. McGreevy** is in charge.

Despatch Oven Company, Minneapolis, Minn., has appointed **Earl H. Seelbach,** 381 Ellicott Square, Buffalo, N. Y., district engineer in charge of sales in western New York, the Erie, Pa., area, etc. Company makes industrial ovens, paint straining and finish conditioning, heat treating and materials handling equipment.

Bagdad Copper Corporation is constructing a fabricating plant at Sandusky, Ohio, to have capacity of 10 tons per hour. It is part of a program under which the company plans to fabricate and market the output of its own mines. Equipment will include three special reverberatory-type furnaces and more than 160 sets of rolls. The plant will be completed August 1.

Carborundum Company, Niagara Falls, N. Y., manufacturer of abrasive products, grinding wheels, etc., has let general contract for two additions to plant at Niagara Falls, Ont., Can., operated as Canadian Carborundum Company, one unit to be used for mixing and kindred service, and other for fabricating abrasive products. Cost about $225,000, with equipment.

Benson Brass and Chandelier Works, 3888 E. 63rd Street, Kansas City, Mo., are having preliminary plans prepared for rebuilding 2 and 3 story plant at 1417 Agnest Street, destroyed by fire. Estimated cost $60,000. This firm operates the following departments: brass machine shop, tool room, cutting-up shop, spinning, stamping, soldering, brazing, plating, polishing, grinding room and lacquering.

Carran Bearing Metal Company, Ludlow, Ky., has been organized by interests connected with **Carran Foundry and Smelting Works Company, Inc.,** Ludlow, manufacturer of brass and other metal castings, to manufacture metal alloys and kindred products. **J. A. Lind** is one of the incorporators. The following departments will be operated: brass foundry, brass machine shop, casting shop.

McConnell Bronze Casting Company, 32nd and Smallman Streets, Pittsburgh, Pa., recently organized, has started operations. The company occupies the former plant of **Hill-Wallisch Bronze Company. E. E. McConnell** is president, and **A. G. Mercer,** vice-president and treasurer. The following departments are operated: brass, bronze and aluminum foundry; brass machine shop, casting shop.

Long Manufacturing Company, Detroit, Mich., has begun production on a new line of copper radiators for industrial, domestic and other heating service. A subsidiary of Borg-Warner Corporation, Chicago, Long Manufacturing Company formerly concentrated manufacture on automobile radiators and clutches. This firm operates the following departments; brass foundry, brass machine shop, tool room, cutting-up shop, stamping, tinning, soldering, brazing, plating, polishing, japanning.

Hope Windows, Inc., Jamestown, N. Y., has been organized with capital of $1,000,000, to manufacture composite windows of steel and aluminum, screened casements and kindred metal equipment. Principals of the new firm are **Major F. G. Garratt,** Jamestown, president and general manager; **V. Richardson,** New York City, vice-president; **J. Blears** of Jamestown, secretary and treasurer; **M. H. Fisher** and **T. C. Holder** of Jamestown, directors. The firm is the outcome of the recent acquisition of the capital stock of Henry Hope and Sons, Inc., of New York City, by the International Casement Company of Jamestown. Operations are to be concentrated at the International company's plant in Hopkins Avenue, Jamestown, and the products of both concerns, closely allied, merchandized through a single sales organization.

Anderson Brothers Manufacturing Company, Rockford, Ill., is in receiver-

ship. Receiver will carry on the business for creditors and it is believed reorganization will result.

H. **A. Wilson Company,** Newark, N. J., is manufacturing tungsten contacts, rivets and screws for electrical use. The company also has developed a rhodium plating process for coating contact metals.

Frankel Brothers, Ltd., Toronto, Canada, metal dealers, are no longer operating their Montreal branch. A new company, **Frankel Brother Metal Company,** has been formed to continue the Montreal business.

Dings Magnetic Separator Company, Milwaukee, Wis., has appointed **J. M. Lee,** 114 West 17th Street, Los Angeles, Calif., Southern California representative. Mr. Lee also represents **Taylor-Winfield Corporation,** Warren, Ohio. Mr. Lee is head of **J. Max Lee Company,** industrial engineers, specializing in electric heating.

Permold Company, Cleveland, Ohio, producer of permanent molds for aluminum casting, as well as castings, has appointed local sales representatives, as follows: **C. J. G. Fischer,** 721 West 7th Street, Plainfield, N. J., for Atlantic Seaboard; **Rex I. Lee** and his associates, **A. L. Edwards** and **E. D. Loomis,** 212 Humber Building, Highland Park, Mich., selling Permold castings.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

Copper

JUNE 1, 1932.

Recent demand for copper was exceedingly slow, with irregular market movements of a fractional nature both for local and export business. Notwithstanding the drastic price cuts which have been made in the last few months, every reduction has been followed by a subsequent decline in quotations. These adverse factors have discouraged rather than encouraged substantial buying. It is startling to think that during the last five months the domestic price of refined copper has declined from 10½ cents per pound to 5¼ cents. This enormous shrinkage of 5¼ cents per pound since the beginning of the year represents terrific losses. If ever the price of copper was artificially deflated that time is now. There ought to be some mechanism for correcting a situation so basically uneconomic and grossly wasteful.

Copper today is not only selling at a panic price level, but at a price which acts as a positive curb upon progress and prosperity since neither producer nor consumer are able to generate confidence on falling prices. It is consequently of paramount importance to the entire producing and fabricating industries to develop and foster facilities for absorbing the billion pounds of surplus marketable copper now in existence. There is crying need to stop colossal copper losses and restore activity in the manufacturing field.

Zinc

Trend of sales in the zinc market was notably weak a good part of the time last month. Offerings at the beginning of the month were at 2.50 cents East St. Louis basis. It was impossible to develop much activity at that level and the weakening process continued until Prime Western brands were down to 2.30 cents at East St. Louis. From this point it became evident the market was headed for higher figures. Selling pressure was withdrawn, and it was not long before active bidding sent prices on the upward trend. Consumers turned eager purchasers and the market moved up rapidly to 2.60c.@2.65c. East St. Louis delivery. The recent price of 2.30c. is the record low for all time, and testified to the acute depression of this market. Further improvement in demand lifted the price of Prime Western zinc to 2.87½c. at East St. Louis.

Tin

There were several flurries in the tin market during May which caused some sensational price fluctuations both up and down. Early in the month there was a sudden display of strength which lifted the market price of prompt Straits tin from 20.45 cents a pound on May 3 to 22½ cents on May 4. In some instances even higher quotations were made. A movement to liquidate set in, however, at the crest of the market and prices sagged off within a few days to 20.60 cents. Later in the month there were frequent rallies and recessions, and it began to look as if tin would once more assert its speculative functions which have always been among its most striking points. There is, however, clear evidence that the consensus of opinion among producers of tin is that a rigid policy of curtailment at the principal sources of production is necessary for the industry as a whole. A new scheme of drastic curtailment is therefore under consideration and if finally agreed upon will confine output to such moderate proportions as should prevent the development of extreme market weakness. This will tend to stabilize the tin situation with the result that the commodity will command more favorable market support than if supplies were kept up greatly in excess of demand.

Lead

Transactions in lead were in good volume during May. However, demand was not strong enough to advance market prices above the 2.90c. basis East St. Louis, at which level it has remained since March 23. The New York price is also unchanged at 3c. There has been noticeable resistance to lower levels, but present price is the low of the year and compares with a St. Louis low in 1931 of 3.52½c. Production schedules in April were cut 7,964 tons compared with output in March, but shipments during April decreased 5,081 tons so that stocks of lead on hand May 1 amounted to 169,370 tons, against a total stock of 169,091 tons on April 1. Although output has been curtailed, surplus stocks are 35,913 tons larger than they were a year ago. Present stocks exceed total shipments for the last five months, and this condition affects adversely the current market trend. Nearby shipment was in fair demand at the close, and buyers were giving attention to June and July requirements.

Aluminum

In a general way, the aluminum market remains steady on a scattering business. Demand is restricted owing to dull conditions in the automotive and other aluminum using industries. Prices, however, are maintained on virgin metal, and there is no sign of any lower levels for the primary commodity. Secondary aluminum was in fair demand lately and quotations steady. The aluminum situation is kept on a sounder basis than many other metals by reason of a careful adjustment between production and consumption. Radical fluctuations and production losses are consequently less liable to occur.

Antimony

The trend in the antimony market was decidedly lower. In view of slack sales the price of Chinese regulus declined to 5⅛ cents duty paid This is the lowest price for years, and compares with a high of 7 cents in February of this year. Shipments from China to this country are showing a shrinkage, but in spite of that fact values decline. Exports of antimony from China to the United States during the first four months of 1932 totaled 525 tons compared with 825 tons during the same period in 1931.

Quicksilver

Selling of quicksilver has been at lower prices. Demand is restricted, and quotations have dropped to $65 per flask.

Platinum

The course of this market reveals no new feature of importance. Refined platinum quotes $37.00 per ounce. Rich deposits of platinum ore have been discovered in Russia according to recent reports from that country.

Silver

A generally easier tone developed in the silver market in the earlier part of May and at that time the domestic price struck the low point of the year at 27 cents per ounce. This was over 10 cents an ounce under the high point of 37¼ cents in 1931. The high this year was 31 cents on February 23. A recent mild rally sent the price to 27⅞ cents, but depressing influences continue here and abroad. Advocates for stabilization of silver stress the necessity for a world silver conference. It is pointed out that the difference in price between silver and gold is greater than it has ever been. Silver lost its money status many years ago, and it will require international action to remonetize silver. There is great difficulty, however, in getting the nations of the world to take steps in bringing about such an agreement.

Old Metals

Market conditions for copper and brass grades declined to new lower levels in sympathy with the easier tone for new metal. Buying for domestic account was limited, but a fair tonnage was taken by exporters. The local trade buy sparingly owing to light requirements. Lead and aluminum grades in the list of old metals were reported in fair demand. There has been a conspicuous lack of aggressive buying such as would lend support to the market. The entire group of secondary metals have been under pressure so long that dealers operate on narrow margins. Declining quotations have also made consumers cautious.

The Wrought Metal Business

By J. J. WHITEHEAD

President, Whitehead Metal Products Company of New York, Inc.

JUNE 1, 1932.

It is still believed that favorable developments are at hand. The agencies that have been working to correct the situation are beginning to become effective. Even Congress, which has been a cat and dog affair, seems to be quieting down, and probably in the end will do a great deal to cheer up manufacturers.

In the case of copper, some believe that the recent Senate approval of the 4c tariff is going to help the price, and there is considerable interest all around as to whether it will or not.

During the past month the wrought metal business has experienced a slight seasonal slackening due to the low level of activity that prevailed on May 1st. As repeatedly pointed out, it is believed that from now on the progress of the wrought metal business will depend upon, and will follow, the trend of business in general.

It is believed that copper and the other non-ferrous metals are about as low as they are going to go. This does not mean however that if tonnages of distress metal are thrown on the market that lower prices for such will not be witnessed.

The copper industry has uncovered a large potential market for its products, such as tanks and pipe in water heaters and storage tanks. Gas companies, water heater companies, and others are all thoroughly sold on the need for using a corrosion resistant metal for water heating and storage equipment.

The Monel metal sink is now selling at a price that should result in an active demand for this article. Besides, the nickel and Monel industries are developing other outlets for their products that will be universally used. There is no question that alloy steel is the steel of the future, and that nickel and other non-ferrous metals are going to play an important part in such alloys.

Aluminum, too, is finding new applications in a great many places. The tonnage used to-day may be relatively small, but active sales promotion efforts will produce results.

Aluminum seems to enjoy a natural advantage as compared to some of the other metals in that it is only one-third as heavy, and this fact is of tremendous importance in construction work.

Daily Metal Prices for the Month of May, 1932

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	2	3	4	5	6	9	10	11	12	13	16	17	18
Copper c/lb. Duty Free													
Lake (Del.)	5.875	5.875	5.75	5.75	5.75	5.75	5.75	5.75	5.625	5.625	5.625	5.625	5.625
Electrolytic (f.a.s. N. Y.)	5.75	5.60	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.375	5.375	5.375	5.375
Casting (f.o.b. ref.)	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.375	5.375	5.25	5.25	5.125	5.125
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	2.55	2.55	2.50	2.50	2.50	2.50	2.50	2.45	2.375	2.35	2.30	2.30	2.325
Brass Special	2.65	2.65	2.60	2.60	2.60	2.60	2.60	2.55	2.475	2.45	2.40	2.40	2.425
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	20.00	20.45	22.00	22.125	22.00	21.15	20.60	21.375	20.80	20.40	20.50	20.375	20.90
Pig 99%	19.40	19.80	21.25	21.375	21.30	20.50	19.90	20.70	20.125	19.65	19.75	19.625	20.25
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Electrolytic 99.9%	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb	5.35	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.25	5.25	5.25	5.125	5.125
Silver c/oz. Troy Duty Free	27.25	27.00	27.125	27.25	27.25	27.625	27.75	27.875	28.00	27.875	28.75	28.50	28.25
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

	19	20	23	24	25	26	27	*30	31	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	5.625	5.50	5.375	5.375	5.50	5.50	5.50	.....	5.50	5.875	5.375	5.631
Electrolytic (f.a.s. N. Y.)	5.375	5.25	5.25	5.25	5.25	5.25	5.25	.....	5.25	5.75	5.25	5.404
Casting (f.o.b. ref.)	5.125	5.00	5.00	5.00	5.125	5.125	5.125	.....	5.00	5.50	5.00	5.262
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	2.35	2.50	2.50	2.65	2.875	2.875	2.90	.....	2.90	2.90	2.30	2.536
Brass Special	2.45	2.60	2.60	2.75	2.975	2.975	3.00	.....	3.00	3.00	2.40	2.636
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	21.25	21.25	20.875	21.10	21.00	20.75	20.625	.....	20.375	22.125	20.00	20.948
Pig 99%	20.65	20.625	20.125	20.375	20.25	20.00	19.875	.....	19.50	21.375	19.40	20.239
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	2.90	2.90	2.90	2.90	2.90	2.90	2.90	.....	2.90	2.90	2.90	2.90
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	23.30	.....	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Electrolytic 99.9%	35	35	35	35	35	35	35	.....	35	35	35	35
Shot (from remelted electroylitic)	36	36	36	36	36	36	36	.....	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	.....	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb	5.125	5.125	5.125	5.125	5.125	5.125	5.125	.....	5.125	5.35	5.125	5.212
Silver c/oz. Troy Duty Free	27.875	27.75	27.75	27.75	27.875	27.875	27.625	.....	28.00	28.75	27.00	27.762
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.00	37.00	37.00	.....	37.00	37.50	37.00	37.405

Metal Prices, June 6, 1932

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 5,625. Electrolytic, 5.50. Casting, 5.25.
Zinc: Prime Western, 2.825. Brass Special, 2.925.
Tin: Straits, 20.00. Pig, 99%, 19.375.
Lead: 2.90. Aluminum, 23.30. Antimony, 5.125.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $64. **Bismuth,** 85.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price June 7) 27.875.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $36.00 to $40.00.

Duties: Copper, free; zinc, 1¼c. lb.; tin, free; lead, 2½c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	Duty
Brass Ingots, Yellow	4½to 6½	45%
Brass Ingots, Red	6 to 7¼	45%
Bronze Ingots	7 to 9½	45%
Aluminum Casting Alloys	19 to22	4c. lb.
Manganese Bronze Castings	18 to35	45%
Manganese Bronze Ingots	6 to10	45%
Manganese Bronze Forgings	26 to35	45%
Manganese Copper, 30%	17 to25	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	7¼to10	45%
Phosphor Copper, guaranteed 15%	9¾to15	3c. lb.
Phosphor Copper, guaranteed 10%	9½to14	3c. lb.
Phosphor Tin, no guarantee	26 to38	Free
Silicon Copper, 10%	17 to35	45%
Iridium Platinum, 5%	$42.00	Free
Iridium Platinum, 10%	$44.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	3⅜to 3⅝	Free
Light copper	2⅞to 3⅛	Free
Heavy yellow brass	1⅝to 1¾	Free
Light brass	1⅛to 1⅜	Free
No. 1 composition	2½to 2¾	Free
Composition turnings	2⅜to 2½	Free
Heavy soft lead	2 to 2¼	2½c. lb.
Old zinc	1 to 1¼	1½c. lb.
New zinc clips	1⅜to 1⅝	1½c. lb.
Aluminum clips (new, soft)	9 to10	4c. lb.
Scrap aluminum, cast, mixed	2½to 2¾	4c. lb.
Scrap aluminum sheet (old)	6 to 7	4c. lb.
No. 1 pewter	11½to12	Free
Electrotype and stereotype	1⅞to 2	2½c. lb.*
Nickel anodes	20¼to22¼	10%
Nickel sheet clips; rod ends (new)	23¼to24¼	10%
Monel scrap	6 to 9	3c. lb.

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective May 19, 1932.

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled	14⅞c.	2½c. lb.
Bare wire	8c.	25%
Seamless tubing	14⅜c.	7c. lb.
Soldering coppers	15⅜c.	45%

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	20½c.	10% Quality	23⅝c.
15% Quality	22¾c.	15% Quality	27⅝c.
18% Quality	24c.	18% Quality	31⅛c.

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

Net per lb.	High Brass	Low Brass	Bronze	Duty
Sheet	12c.	13⅛c.	13½c.	4c. lb.
Wire	12c.	13⅛c.	13½c.	25%
Rod	9¾c.	13⅛c.	13½c.	4c. lb.
Open seam tubing	19¾c.		21¼c.	25%
Angles, channels	19¾c.		21¼c.	12c. lb.
Seamless tubing	15¼c.		16⅝c.	8c. lb.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound.	(Duty 4c. lb.)
Tobin Bronze Rod	13½c.
Muntz or Yellow Metal Sheathing (14"x18")	14⅛c.
Muntz or Yellow Rectangular sheet other sheathing	14⅛c.
Muntz or Yellow Metal Rod	10¾c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb. 32.30
Aluminum coils, 24 ga., base price 30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods 50c. Cold Rolled Sheet 60c.
Hot Rolled Rods 45c. Full Finished Sheet 52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base) 35 Full Finished Sheets (base) 42
Cold Drawn Rods (base) 40 Cold Rolled Sheets (base) 50

SILVER SHEET

Rolled sterling silver (June 7) 31.00c. per Troy oz. upward, according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	6.25	2⅜c. lb.
Cut Lead Sheet (base price)	6.50	2⅜c. lb.

BLOCK TIN AND BRITANNIA METAL SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs or over .....15c. above N. Y. pig tin price
100 to 500 lbs. .....17c. above N. Y. pig tin price
Up to 100 lbs. .....25c. above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, June 6, 1932

ANODES

Copper: Cast ..... 17½c. per lb.
Rolled, sheets, trimmed ..... 16⅜c. per lb.
Rolled, oval ..... 14 c. per lb.
Brass: Cast ..... 17 c. per lb.
Zinc: Cast ..... 10½c. per lb.

Nickel: 90-92% ..... 40c. to 45c. per lb.
95-97% ..... 42c. to 46c. per lb.
99% cast, 44c. to 48c.; rolled, depolarized, 45c. to 49c.
Silver: Rolled silver anodes .999 fine were quoted June 7 from 31.00c., per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	$13.37	to $13.80
14" 20 ply 64/68 Unbleached	21.60	to 22.65
11" 20 ply 80/92 Unbleached	17.00	to 17.55
14" 20 ply 80/92 Unbleached	26.37	to 28.00
11" 20 ply 84/92 Unbleached	21.69	to 21.90
14" 20 ply 84/92 Unbleached	35.37	to 36.15
11" 20 ply 80/84 Unbleached	21.69	to 21.90
14" 20 ply 80/84 Unbleached	35.37	to 36.15

Sewed Pieced Buffs, per lb., bleached ..... 41c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 75 to 400 lb. drums	lb.	.13 -.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	11.30-18.00
Denatured drums	gal.	.356-.436
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.04
Ammonia, agua, 26 deg., drums, carboys	lb.	.02¾-.05
Ammonium sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal	.58
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.08
Chrome Green, bbls.	lb.	.19
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	.038-.05¼
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluorspar, f.o.b., carload lots	ton	$17.50-32.00
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.25 -.27½
Cyanide (fluctuating)	oz.	.32½-.37½
Nitrate, 100 ounce lots	oz.	.21¾-.23¾
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate	lb.	.05-.06¼
Nitrate, tech., bbls.	lb.	.03¼-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate	lb.	.21
Sulphocyanide	lb.	.30 -.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.25½-.27
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½